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Construction

Methods and Equipment

McGraw-Hill Publishing
Company, Inc.

August, 1937

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MICHIGAN ASPHALTIC CONCRETE CREW
lays smooth pavement with batches of
uniform temperature obtained by automatic
heat control at asphalt plant.

IN THIS ISSUE:

Reinforced Brick Panels Form House Walls

Dam Closure Diverts River at Fort Peck

Labor Agreements That Work in Building Trades

Special Equipment Builds Sewer in Wet Quicksand

Wide Construction Front Covered in Building Texas Dam

Asphalt Plant Output Raised by Automatic Heat Control

Pictorial News • • • Construction Details • • • Oddities • • • Personalities • • • Equipment News

Used 7 Times in Rock!

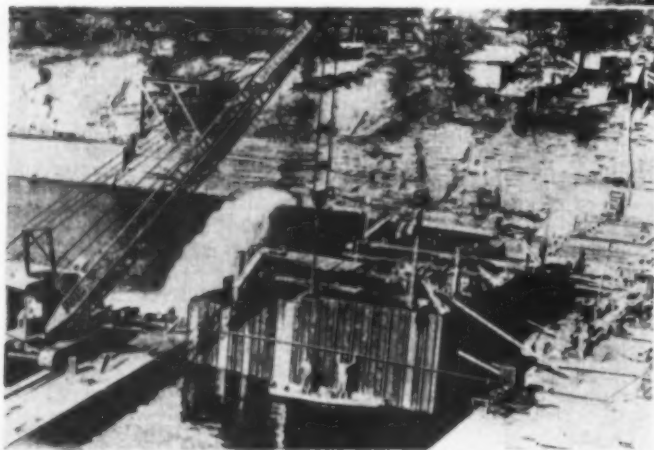
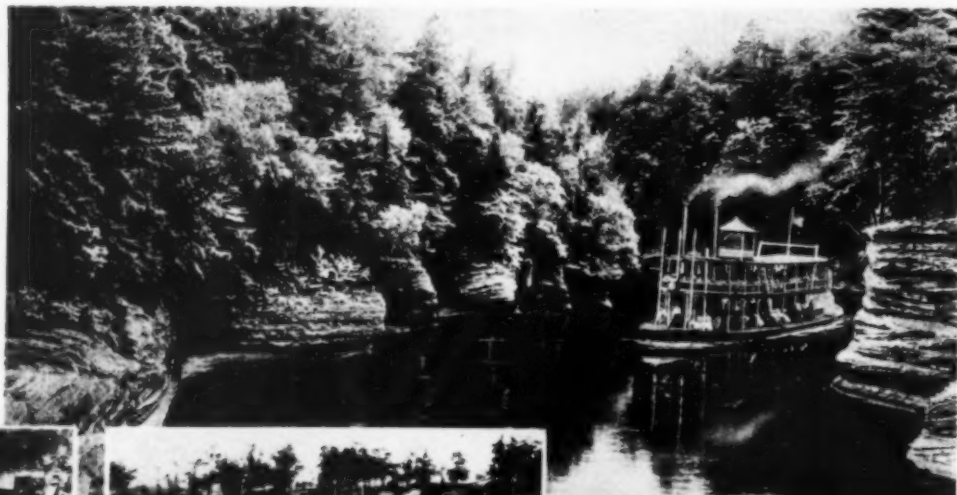
INLAND PILING

MAKES PERFECT ECONOMY RECORD AT THE DELLS

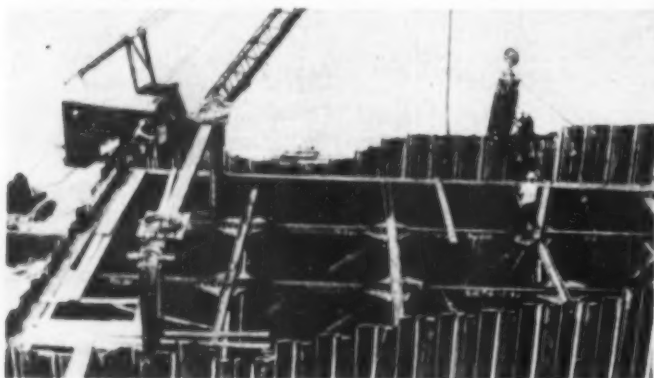
Building seven successive cofferdams at the picturesque Dells of the Wisconsin River, made more than ordinary demands on the piling.

The river bed line is shale. It was necessary to drive the piling into this shale. Then holes were drilled and grout was forced into the fissures under pressure.

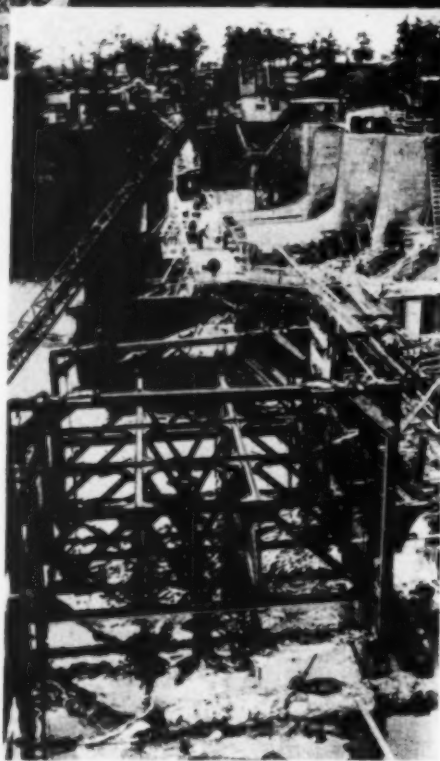
Inland Steel Piling Section I-31 was chosen for this hard driving, and the same piling was driven and pulled for all



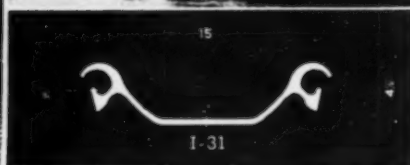
Pumping out the cofferdam. The piling and steel bracing were used seven times to complete the job.



This view shows the assembling and driving of the piling around the steel bracing. This bracing was passed through the Toe Dam with splices near the face of the concrete to minimize the waste of bracing left in the wall.



Steel bracing was floated to place and lowered with spud piles to the proper level. End cofferdam bulkheads are shown in the background.



seven temporary installations. It remained watertight and in good condition throughout.

Inland engineers are widely experienced in piling work, as well as in all other types of steel construction. Their co-operation saves time and money for the contractor. Their services are always available, from the earliest blueprint stages.

Call them on your next job.

Inland services include the sale and leasing of both new and used piling.

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TECHNOLOGY DEPT.

August, 1937 — CONSTRUCTION Methods and Equipment

Construction

Methods and Equipment

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AUGUST, 1937

CURRENT JOBS

... and Who's Doing Them

Buildings

Public—General contract for charity hospital in New Orleans was awarded to **George A. Fuller Co.**, of Washington, D. C., for \$5,894,000; foundation contract on foregoing structure went to **R. P. Farnsworth**, of New Orleans, for \$715,380. The Parkside housing project in Detroit, Mich., a PWA job, was bid in for \$3,395,000 by **John Griffiths & Sons Co.**, of Chicago. **John Kennedy & Co.**, of New York, with a bid of \$3,077,800, obtained contract for court house in Jamaica, N. Y. For a new high school in Philadelphia, Pa., a bid of \$1,389,000 by **McCloskey Co.**, of Philadelphia, was successful. In San Francisco, **MacDonald & Kahn Co., Ltd.**, is building railway terminal building in connection with Bay bridge, for \$1,658,510. Successful contractor for PWA's Summerfield housing project in Minneapolis, Minn., was **Walter Butler Co.**, of Minneapolis, with price of \$2,225,000. A \$1,382,200 high school contract in Philadelphia, Pa., went to **John McShain, Inc.**, of Philadelphia. Low bid of \$1,081,179 for a school building in Toledo, Ohio, was submitted by **H. J. Spieker Co.**, of Toledo. In Brooklyn, N. Y., **Pstay & Fuhrman, Inc.**, of New York, are building a \$747,000 court house. A \$573,000 post office building contract in Houston, Texas, went to **J. I. Barnes**, of Springfield, Tex.

Commercial—A 19-story apartment building at Riverside Drive and 86th St., New York City, is under construction by **Kleban Construction Co.**, of New York, at cost exceeding \$3,000,000. A \$2,000,000 memorial hospital in Chicago, Illinois, was bid in by **Dahl-Stedman Co.**, of Chicago. College building for Massachusetts Institute of Technology, Cambridge, Mass., to cost \$1,100,000, is under construction by **Stone & Webster Engineering Corp.**, of New York. In Philadelphia, Pa., **Carroll Construction Co.**, is building a \$1,000,000 8-story concrete apartment. A \$500,000 contract for library building at Colby College, Waterville, Me., was awarded to **Hegeman-Harris Co., Inc.**, of New York City. In Columbia, S. C., low bidder for \$500,000 hospital was **Southeastern Construction Co.**, of Charlotte, N. C.

Industrial—On a steel mill project at Braddock, Pa., for Carnegie-Illinois Steel Corp., **Rust Engineering Co.**, of Pittsburgh, obtained contract for foundations, sewers and concrete work as part of \$15,000,000 project. At Painesville, Ohio, contract for rayon plant to cost \$7,500,000 went to **Hunkin-Conkey Construction Co.**, of Cleveland; steel for foregoing project will be supplied by **Bethlehem Steel Corporation**. Factory structures for Bendix Aviation Corp., at Bendix, N. J., will be built by **Turner Construction Co.**, of New York, at cost of about \$3,000,000. As part of a \$2,000,000 plant improvement project for Republic Steel Corp., at Gadsden, Ala., **Nashville Bridge Co.**, of Nashville, Tenn., obtained contract for extension to open hearth building. For a beet sugar plant in Hardin, Mont., to cost \$1,500,000, the contractors are **Collison & Dolven**, of Billings. In Des Moines, Ia., a \$1,500,000 power plant is being built by **A. H. Neumann & Bros.**, of Des Moines. A \$1,000,000 industrial plant for Alcosac Corp. in Front Royal, Va., was bid in by **Wark Co.**, of Philadelphia.

Work is starting on a \$1,000,000 power plant in Omaha, Neb., for which **Phoenix Engineering Co.**, of New York, is contractor.

Highways

Among important state highway contracts awarded last month were the following: New York: \$427,343 for 14 mi. in Essex and Warren Counties to **Louis Mayersohn**, of Albany; \$503,903 for 5.4 mi. in Ulster County to **Lane Construction Co.**, of Meriden, Conn.; \$371,837 for 3.8 mi. in Schoharie County to **T. A. Brogan**, of Yonkers, N. Y.; \$368,132 for 7 mi. in Suffolk County to **J. M. Murray**, of Rochester, Mississippi; \$367,106 for 17.8 mi. in Tunica County to **Forcum-James Construction Co.**, of Dyersburg, Tenn.; \$419,544 for paving a bridge in Pontotoc County to **M. Harvey**, of Batesville, Miss. California: \$848,193 for 8.4 mi. of road-mix in Alameda County to **Granfield-Farrar & Carlin**, of San Francisco. Pennsylvania: \$814,063 for relocating and widening Banksville Road in Pittsburgh, to **Booth & Flinn**, of Pittsburgh, New Jersey: \$650,266 for Perth Amboy bypass to **P. Camillo & Co., Inc.**, of Westfield, N. J.; \$639,016 for concrete pavement in Somerset County, to **Roberts Paving Co.**, of Salisbury, Pa. Iowa: \$240,031 for 10 mi. of concrete paving in Osceola County to **Booth & Olson, Inc.**, of Sioux City, Kentucky: \$220,574 for 6 mi. of concrete road in Clark County, to **Louis Des Cognets & Co.**, of Lexington, South Carolina: \$353,739 for 14 mi. of bituminous paving in Chester County to **E. W. Grannis**, of Fayetteville, N. C. Ohio: \$452,517 for repaving, retaining walls and sewers in Cincinnati to **Middle West Roads Co.**, of Cincinnati. Nebraska: \$378,859 for 18 mi. of road in York County to **Allied Bridge & Construction Co.**, of Omaha. Florida: 14 mi. of bituminous paving in Orange County to **Ebersbach Construction Co.**, of Tampa.

Waterworks

A \$737,777 contract for caissons and cutoff trench for New York Board of Water Supply was awarded to **Triest Contracting Co.**, of New York. Waterworks improvements at Safford, Ariz., are under way, at cost of \$310,413 by **E. K. Ferguson Sons Co.**, of Spanish Fork, Utah. At Abilene, Tex., **Cage Bros.**, and **J. C. Ruby**, of Bishop, Tex., have a \$230,570 waterworks contract. **John Kerns Construction Co.**, of Omaha, Neb., is building reservoirs at Sioux City, Ia., for \$209,700.

Sewers

In Brooklyn, N. Y., **P. Tomasetti Contracting Co.** has a \$1,861,334 storm sewer contract in Flatbush Ave. Contract for sewage sludge disposal building in Chicago was awarded to **Jacobson Bros.**, of Chicago, for \$492,517. For construction and equipment at Tallman's Island sewage works, New York City, contract for \$1,303,064 was awarded to **North Eastern Construction Co.**, of New York. Combined sewers in Brooklyn, N. Y., are being built by **Luang Construction Co.**, of Brooklyn, for \$1,251,304. **C. F. Vachris**, of Brooklyn, has \$977,912 sewer contract in Borough of Queens. In Buffalo, N. Y., **Lombardo Bros. Construction Co.** is engaged on \$459,739 sewage

The "How" of it

For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:

- How ASPHALT PLANT PRODUCTION for paving was increased by automatic heat control. — p. 40
- How FLOATING RUNNERS on bituminous spreader boxes ironed out irregularities in base. — p. 43
- How SCREED of bituminous finishing machine, on cold mornings, was heated from compressed gas tanks. — p. 43
- How LABOR AGREEMENTS work under closed-shop conditions in Niagara Falls, N. Y. — p. 46
- How SEWER CONSTRUCTION in ground below sea level was handled with special equipment. — p. 48
- How STEEL SHIELD on boom of ditching machine held sides of trench until sheeting was placed. — p. 48
- How SLACKLINE CABLEWAY EXCAVATOR, rigged on dragline, dug underwater channel. — p. 48
- How WELL-POINT SYSTEM dewatered trench. — p. 48
- How POLES of Douglas fir, 130 ft. long, were erected for radio antenna system. — p. 52
- How REINFORCED BRICK PANELS formed load-bearing walls for houses. — p. 56
- How SPECIAL ANCHORS helped swing digging end of hydraulic dredge. — p. 58
- How PORCELAIN ENAMEL FACING was used for walls of bus terminal. — p. 58
- How BUMPS in pavement are detected by portable machine. — p. 58
- How ROOF for Exposition building was made of corrugated iron hung from steel trusses. — p. 58
- How WALL ANCHORAGE held protective steel plate on truck ramp. — p. 59
- How CIRCULAR STORAGE proved effective for handling concrete aggregates. — p. 64
- How RIVER DIVERSION was effected by making closure in dam. — p. 66

ROBERT K. TOMLIN
Editor

WILLARD CHEVALIER
Vice-President

Editorial Staff: Vincent B. Smith, John B. Huttel (San Francisco), Paul Wooton (Washington), Nelle Fitzgerald

tank project for sewage plant and incinerator at St. Paul, Minn., low bidder was **W. W. Magee Co.**, of St. Paul, with price of \$466,230.

Bridges

At Baton Rouge, La., superstructure contract for Mississippi River bridge went to **Bethlehem Steel Co.**, for \$3,705,855. **American Bridge Co.**, of New York City, with bid of \$1,128,800 obtained contract for towers of Bronx-Whitestone bridge across East River, New York City. At Galveston, Tex., \$418,000 contract for bascule drawspan went to **Austin Bridge Co.**, Dallas, Tex.

Miscellaneous

Another section of the Sixth Ave. subway, New York City, was awarded to **Spencer, White & Prentiss, Inc.**, of New York, for \$6,959,000. New Jersey approach to Lincoln tunnel crossing Hudson River, will be built by **G. N. Brewster & Co.**, of New York, for \$287,205.

For dredging and filling in connection with East River Drive, New York, **Fredrick Snare Corp.**, New York, obtained contracts of \$1,200,509 and \$1,219,713. Tongue River dam in Montana will be built by **J. C. Boespflug**, of Miles, Mont., for \$726,364.

Railroad changes and track work at High Point, N. C., costing \$325,028 are being handled by **Blythe Bros. Co.**, of Charlotte. **Ryberg Bros.**, of Salt Lake City, Utah, will build a \$700,000 tunnel at Tooele, Utah. Contractor for \$500,000 race track plant at Arcadia, Calif., is **Lindgren-Swinerton**, of Los Angeles.

Railroad Electrification

As part of its \$50,000,000 program of main line electrification involving 315 mi. of line, the Pennsylvania Railroad has awarded contracts to **McCloskey & Co.**, of Philadelphia; **Vare Construction Co.**, of Philadelphia; **Loucheim, Brown & MacDonough**, of Philadelphia, and **Arundel Corp.**, of Baltimore.

To Make Routine of the Impossible

FREQUENTLY one hears it said that some particular large construction project could not have been built twenty or twenty-five years ago. Usually the speaker has in mind the economic aspects of the undertaking: he means that the population or the business volume of that time would not have justified doing the job or that the investment otherwise would have been excessive.

Such statements, of course, are quite true. Many great projects today are justified by greater demand and use than could have been expected a few years ago. The increasing productivity of our people makes available greater resources from which to finance new facilities and services to gratify their rising standards of comfort and convenience. No doubt we can afford vaster and more imposing works formerly beyond our means.

But however true it may be that such works could not have been built for economic reasons, it is equally true that, in a more literal sense, many of them could not have been built at all. Today the designer and the constructor both have at their disposal materials with new properties and tools of new capacities that make possible wholly new methods of engineering attack. These have come from the laboratories and shops of manufacturers, from the drawing rooms of engineers and from the field operations of constructors. Their efforts have converted the impossibilities of yesterday into the routine of today. And in like fashion the impossibilities of today will become the routine of tomorrow.

NO SMALL CREDIT for this consistent conquest of the impossible must go to the system of construction by competitive contract. It is true that the scientist and the professional man might be just as capable and as willing to do their stuff under some other system: it is a question whether they would have their chance. After all, their opportunities must wait upon the enterprise of those who would apply their work to practical purpose. That enterprise waits in turn upon incentive; and it is right here that the community suffers when we strike down the competitive urge in any field.

It is easy enough to say that a constructor working under

a socialized system can apply modern methods, materials and equipment just as effectively as can a competitive contractor. But this assumes that he would have those advantages today if we had been under socialized control for the last twenty years and that if we were to go under such a regime today the constructor of twenty years hence would have something better than he has today.

But, without the competitive urge, can we assume that? Every contractor knows how he has racked his brains for a more efficient method that would enable him to underbid a competitor using routine procedure. He knows how he has put the makers of materials and machinery on the spot to help him do that. He knows how often an unintentionally low bid has forced him into trying out some new stunt that became a long stride in the progress of the art.

EVERY MANUFACTURER likewise knows how he has driven his research men and designers to produce something enough better than standard to get the business of that competitive contractor. The contract system is the spur that has driven the technique of construction to its present remarkable proficiency. Every now and then, this competitive urge drives men to attempt beyond their powers, with unfortunate results. But that is the price of progress; without it we should lapse into a state of routine complacency and buck-passing. Men soon would lose the incentive to adventure that stimulates all progress, mental and spiritual as well as material.

All this is one of the chief reasons why we must halt the present trend towards socialization of public works construction. Although we may not feel these effects today or this year, they are inevitable and in time will make themselves felt. Unless we preserve to construction the stimulus of the competitive contract system, the time surely will come when we no longer shall be able to say: "today we can do what twenty years ago would have been beyond our powers."

Willard Chevalier

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Easy maneuverability enables the quick spotting of Trac-Truks and the body, rapidly raised to a high dumping angle, saves time and trouble in unloading.

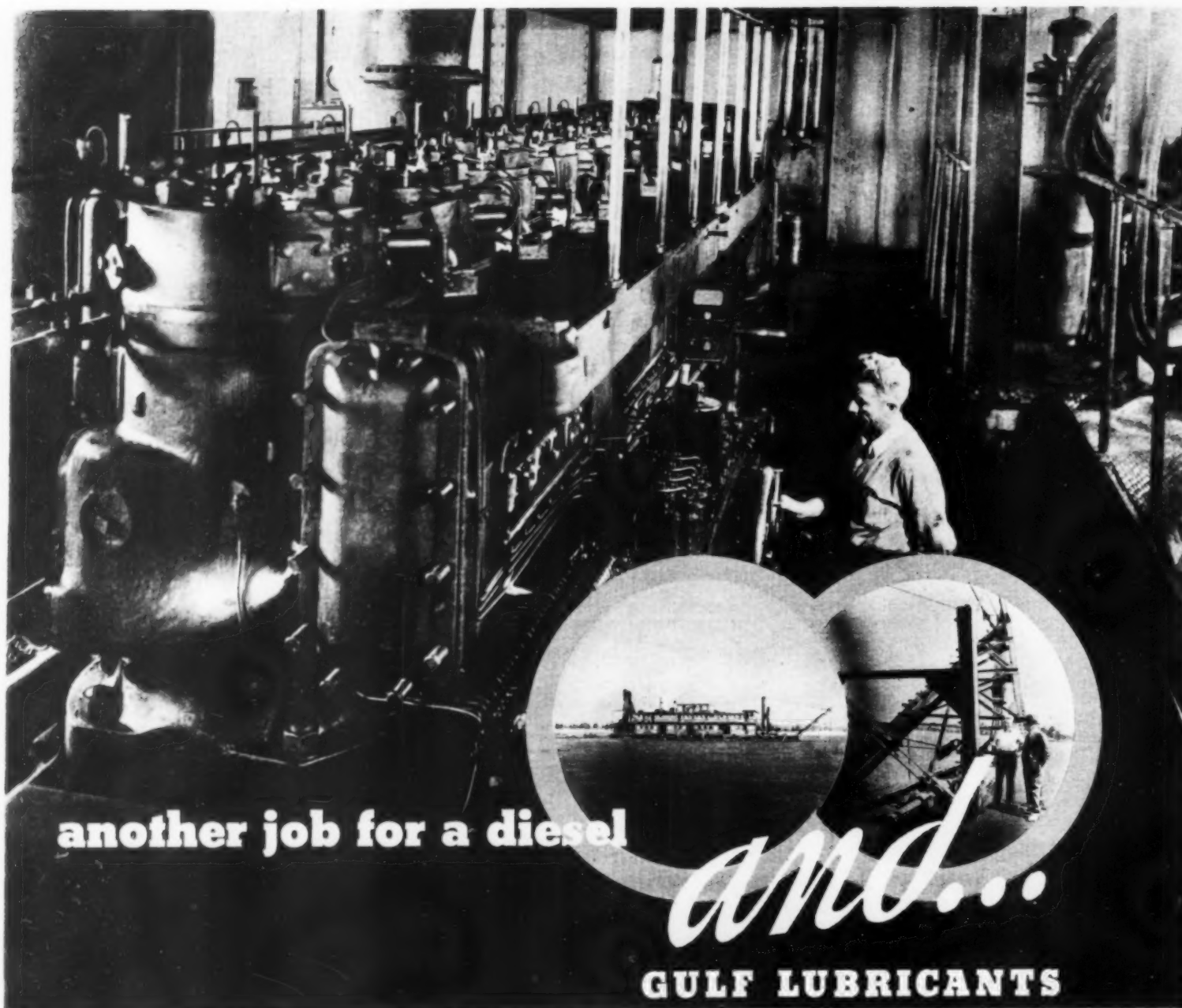
Offering more all around utility for hauling from open pit mines—with greater maneuverability and better performance on the sharp turns, resulting from shorter wheel base. Powered by Cummins six-cylinder Diesel engine providing for low fuel consumption and economy on the heavy up-grade hauls. Equipped with 10 yd. water level capacity rear dump type of body which is suitable for hauling both ore and overburden and applicable to other material handling uses about the mine. The operations shown are at the Butler Bros. Company Louise Mine near Crosby, Minnesota, where an opportunity is afforded to verify performance by witnessing these units in action.

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another job for a diesel

and...

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Operators of "NORMAN H. DAVIS" famous dredge that raised the Maine in Havana Harbor, protect newly installed Diesel with Gulf lubricants

There was no Diesel in the famous dredge "Norman H. Davis" when she raised the battleship Maine in Havana Harbor. But there is today—and her owners have played safe with its lubrication. They called in the Gulf engineer to recommend the proper lubricants for this husky Diesel. And now it is giving efficient low-cost service on a big dredging job off the Florida coast, say the owners.

America's Diesel engine builders—more than 50 strong—have approved Gulf lubricants for the en-

gines they build! So, when the Gulf engineer recommends certain brands for your Diesels, you *know* they are the *right* brands. And you know that your equipment is protected against excessive wear and maintenance expense.

Every operator of Diesel engines, from Maine to Texas, can have the benefit of Gulf lubrication service—an inexpensive way to insure high-speed, low-cost work. We suggest that you talk with the Gulf engineer when he calls.

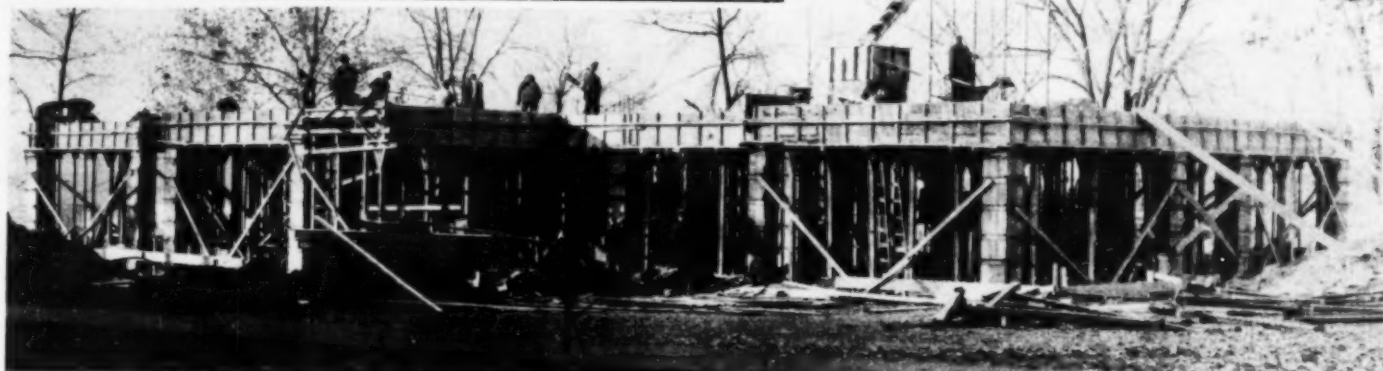
GULF OIL CORPORATION



GULF REFINING COMPANY

GENERAL OFFICES: GULF BUILDING, PITTSBURGH, PA.

'INCOR' SAVES 65c CU. YD.: Typical 'Incor' building job: Fulton Hospital, Fulton, Mo. — 6 stories and roof, concrete frame. Contractor estimated two ways: Lone Star and 10-day stripping meant 78-day completion; 'Incor' and 3-day stripping reduced time by 30 days. 'Incor' saved \$695 net — or 65c cu. yd. of concrete. 'Incor' saves on wall-bearing jobs, too; read details, below.



SKELETON-FRAME OR WALL-BEARING JOB, 'INCOR' SAVES ON BOTH

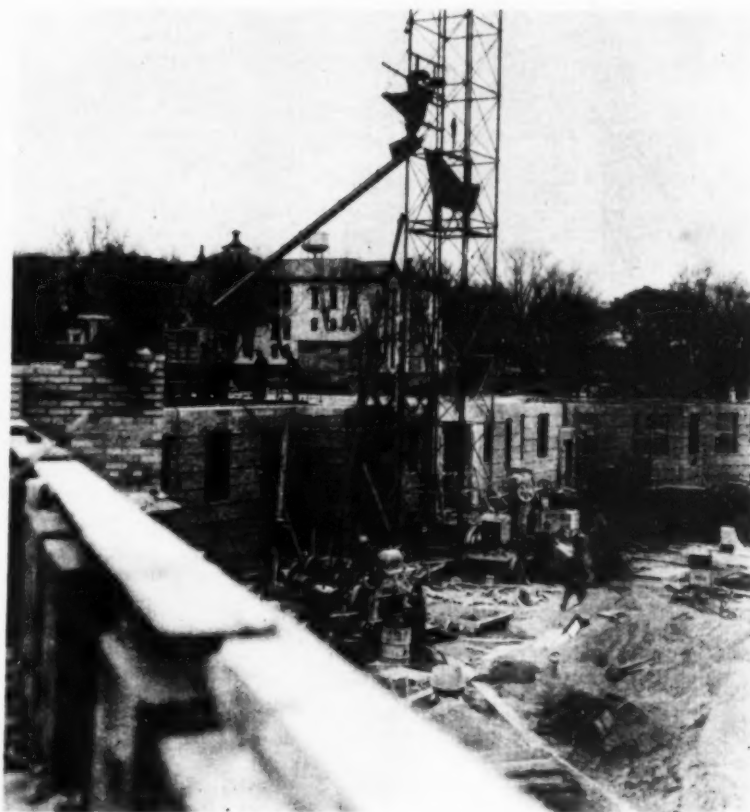
CONSIDER the cost of time: Overhead piles up every day the contractor is on a job. His own time and office expense . . . equipment costs or rentals, taxes, insurance, service charges, interest . . . job office, superintendent, timekeeper, watchman, and frequently concrete-foreman, mixer-operator, hoist-engineer — make up the cost of just being on the job.

"True enough," says the contractor, "but, when you push a job, you run into overtime, and labor costs go up." Right — EXCEPT ON THE FRAME — where time can usually be saved without running into overtime, and where faster completion often means a substantial net saving.

Figure Job Two Ways

Time can be saved in one of two ways — by using extra form sets, or by using 'Incor' 24-Hour Cement. 'Incor' is service strong in one-fifth the usual time. You pull column forms first morning after concreting, start taking down floor forms that afternoon; re-assembly begins at once. Result, a 6-story building, for example, can be completed 10 to 45 days sooner — without extra form sets.

Typical jobs (above and right) illustrate 'Incor' savings, and show why it pays to figure a job two ways—with both Lone Star and 'Incor'. Use 'Incor'* if it shows you a profit. If not, use Lone Star. You gain either way, because better cement makes better concrete. Write for copy of "Cutting Concrete Costs." Lone Star Cement Corporation, Room 2215, 342 Madison Ave., New York. *Reg. U. S. Pat. Off.



'INCOR' SAVES 38c CU. YD.: Wall-bearing job, Psychiatric Clinic, Fulton, Mo. — 3 stories and roof. Lone Star Cement and 10-day stripping meant 79-day completion; 'Incor' and 3-day stripping reduced time 30 days. 'Incor' saved \$826 net — or 38c cu. yd. of concrete.

LONE STAR CEMENT CORPORATION

MAKERS OF LONE STAR CEMENT... 'INCOR' 24-HOUR CEMENT

Gluttons for Work . . .



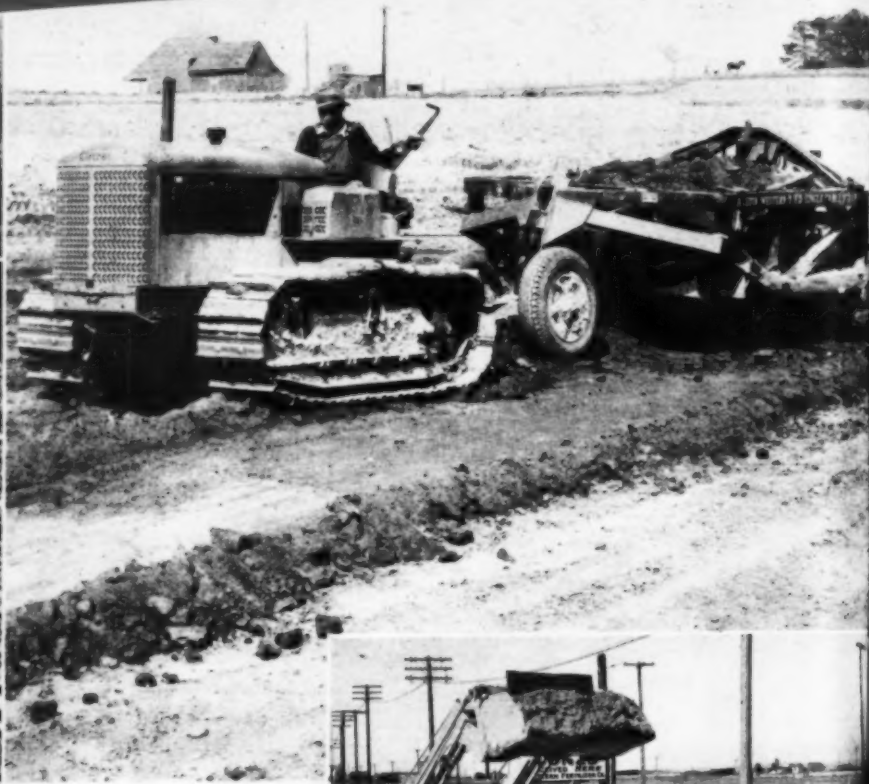
(Above)

Ledge rock, such as this, outside of Pittsburgh, Pa., provides no better than a shifting footing. But Cletracs, with their balanced design, get the needed traction to do the kind of bulldozing that keeps a closely bid job in the black.

(Above at right)

One of a pair of Model DD Cletrac Diesels in Hart County, Georgia, that is moving 50 to 75 yards of pay dirt per unit per hour, depending upon the length of the haul. Of course, like all Cletrac Diesels, they have electric starting.

are the Cletracs



(At the right)

Picking up $\frac{1}{4}$ of a yard of material at every bite, this Cletrac with front end loader is a quick, economical method of handling loose materials. A 6- $\frac{1}{2}$ -foot bulldozer blade replaces the bucket for light backfilling and leveling. It will speed up snow removal tremendously.



Cletrac

Crawler Tractors

Diesel, Tractor Fuel, Gasoline... Six Size . . .

Misers on Costs

YOU put on YOUR JOBS

Cletracs cut fuel costs. Typical is the performance of a Model DD Cletrac Diesel in Vernon County, Missouri. This tractor, with 10-foot grader, maintains 15 to 18 miles of road, both ways, daily, on only 12 to 14 gallons of 7.4 cent fuel.

Cletracs cut repair costs. On a 453,000 cubic yard job in Oregon, completed 45 days ahead of schedule, the total down time for three Cletracs in 276, 21-hour days, almost 18,000 tractor hours, was only 44 hours.

Cletracs cut maintenance costs . . . they are easier, simpler to maintain. Steering bands can be adjusted in less than fifteen minutes; replaced in not much longer. Clutch can be adjusted in five minutes, replaced without disturbing either engine or transmission.

Cletracs do more work. On turns, Cletracs

pull with BOTH tracks. The result is that they can handle larger loads. It takes fewer trips to do a given amount of work. Balanced design which combines lightness in weight with maximum traction increases capacity on grades as much as 19 per cent on a 30 per cent grade. Again it takes fewer trips to do a given job.

And with their rigid main frame . . . the dead axle shaft that takes the jolts and bumps of hard going . . . the solid side frames . . . the fully protected and supported engine . . . the controlled differential steering — an exclusive Cletrac feature — Cletracs are more ruggedly built . . . last longer.

There's good reason why more and more of the big jobs are being done with Cletracs. A rigid investigation will show you why.

The Cleveland Tractor Company, Cleveland, Ohio



This Model DD Cletrac Diesel, operating 10 hours a day, in Vernon County, Missouri, maintains 15 to 18 miles of road, both ways, daily. With a 10-foot grader in high gear, the fuel consumption is only 12 to 14 gallons of 7.4 cent fuel a day. Typical Cletrac economy.



The old chanty of Low Bridge will no longer be heard along the Erie Canal in Erie County, New York after this Cletrac with Emsco Trailbuilder gets through. The old canal is giving way to a park and eventually a boulevard. The fill will require about 600,000 yards of dirt.



This Model AG Cletrac with post hole digger makes short work of digging holes for guardrails, telephone poles, rural electrification. One unit dug and set 500 poles at an average speed of 5½ minutes per pole and an average cost of 44 cents. The cost by hand would have been \$3.00.

Cletrac

REG. U.S. PAT. OFF.
Crawler Tractors
Built To Endure

The only tractors with controlled differential steering that keeps both tracks pulling at all times . . . on the turn as well as on the straightaway.

e . . . Fifteen Models . . . 22. to 94. Horsepower

NON-STOP PERFORMANCE



Crawler-type tractors use Marfak in roller-bearings, plain bearings, track-layer rollers. Shovels use Marfak in roller-bearings, link pins and rollers, and general external lubrication. Motor trucks use Marfak in front wheel bearings, steering connections, universals, shackles, and general chassis lubrication.

YOU can get 24-hour per day service from your graders, shovels, and trucks . . . when you use Texaco's super-lubricant . . . MARFAK.

Marfak is an *unworked* grease-type lubricant . . . tough, cohesive, tenacious. It clings to metal, clings to itself. Seals bearings against dirt and water, but liquefies as needed and feeds to the place where there is frictional heat to be eliminated.

Marfak lasts twice as long as ordinary greases . . . saves greasing time. Many greases, buttery in texture, squeeze out under pressure, soften up

and drip, break down and separate under heat. Cheap to buy, but very expensive to use.

Trained lubrication engineers are available for consultation on the selection and application of Texaco Petroleum Products. Prompt deliveries assured through 2070 warehouse plants throughout the United States.

Start using Texaco Marfak today, and begin to get uninterrupted service from your equipment.

The Texas Company, 135 East 42nd Street, New York City.

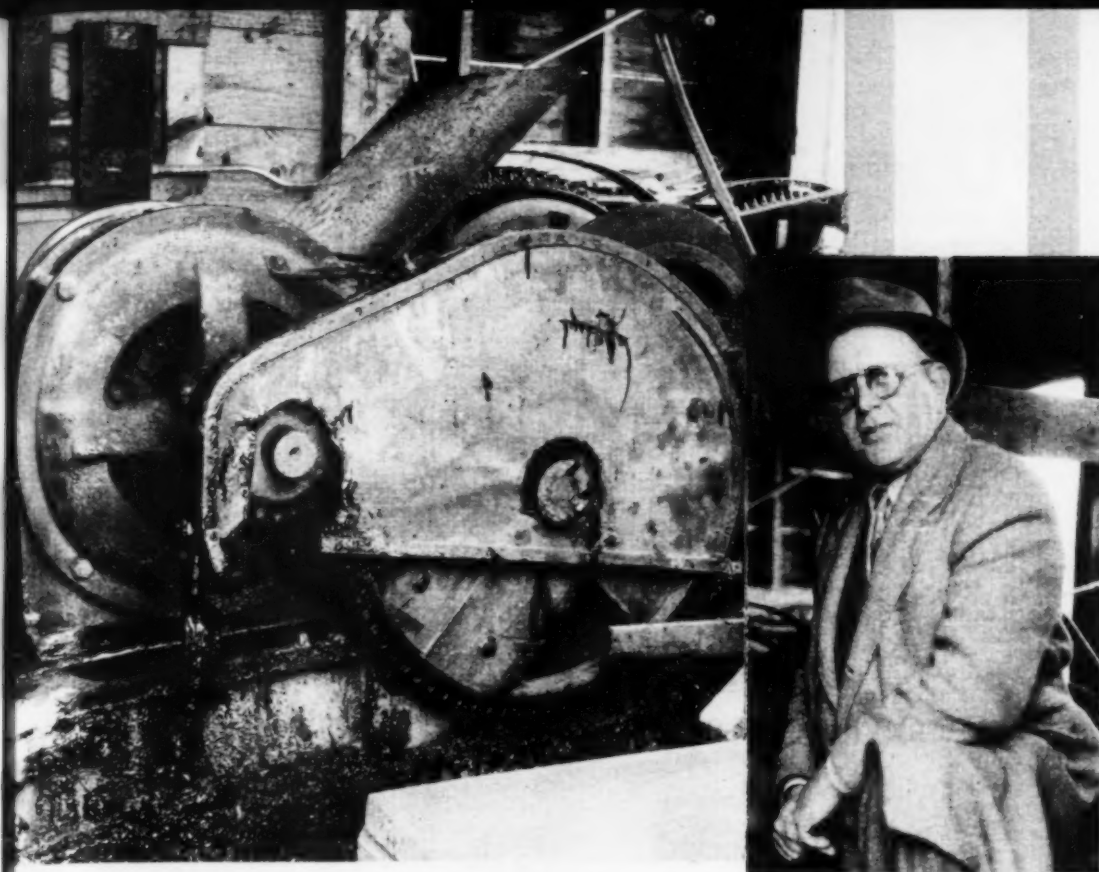


TEXACO

Page 10

MARFAK

August, 1937 — CONSTRUCTION Methods and Equipment



A true veteran in length of service and work accomplished is this old Novo Dragline Hoist owned by Mr. O. W. Lundquist of East Detroit, Michigan, pictured above.

Since March, 1925, this hoist has worked practically every working day — has taken out about 1,000,000 cubic yards of gravel and has never been down for repairs, other than the replacement of normal wearing parts as, friction blocks and brake bands.

The hoist is still in daily service and shows no signs of weakening. Demonstrating the number of years service Novo builds into their complete line of Hoists.

Send for descriptive literature on the type of hoist you need.

The REAL NEWS on NOVO

Pump performance has got to be there when a wellpoint job requires 24 hour a day pumping for a solid 4 months.

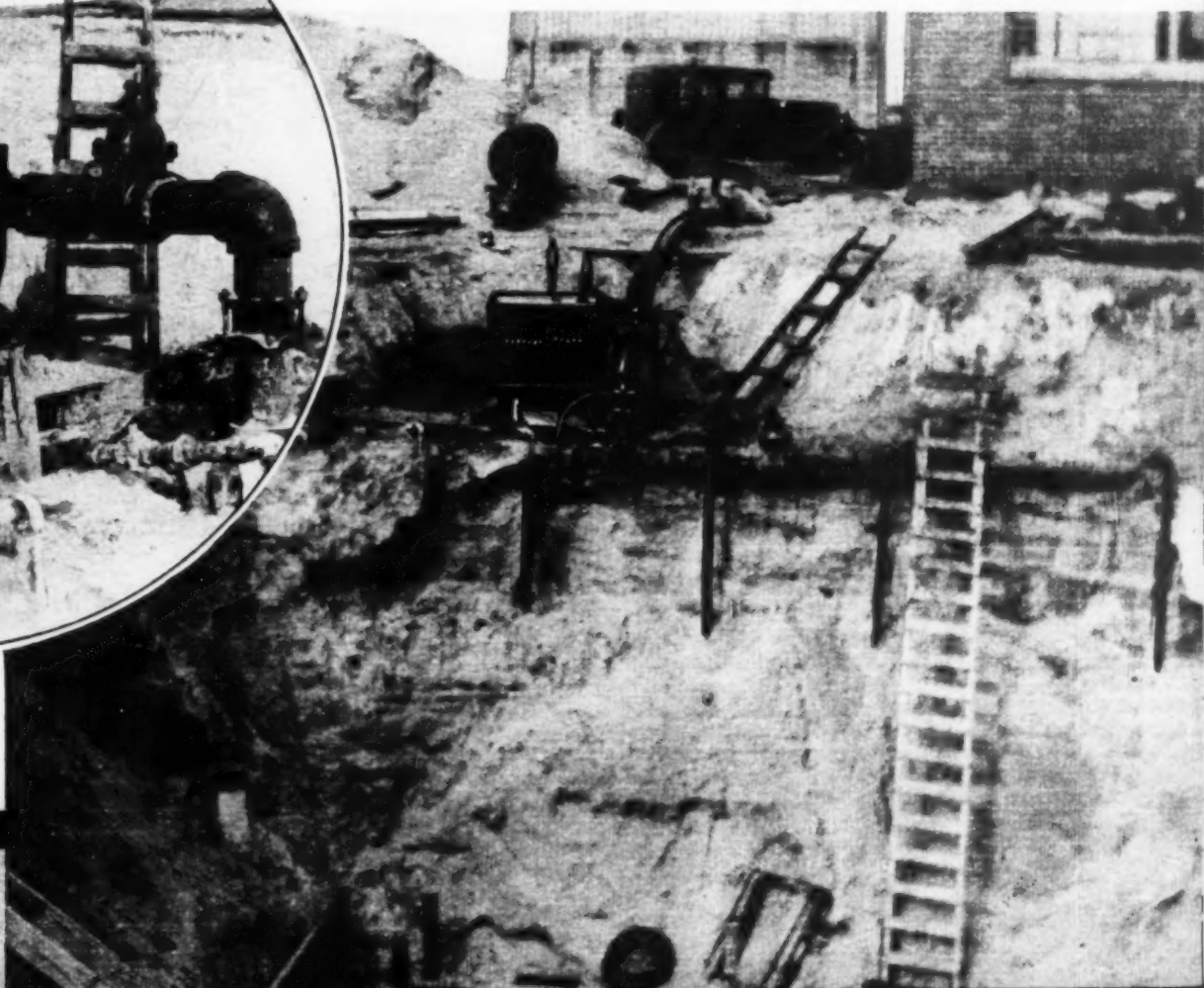
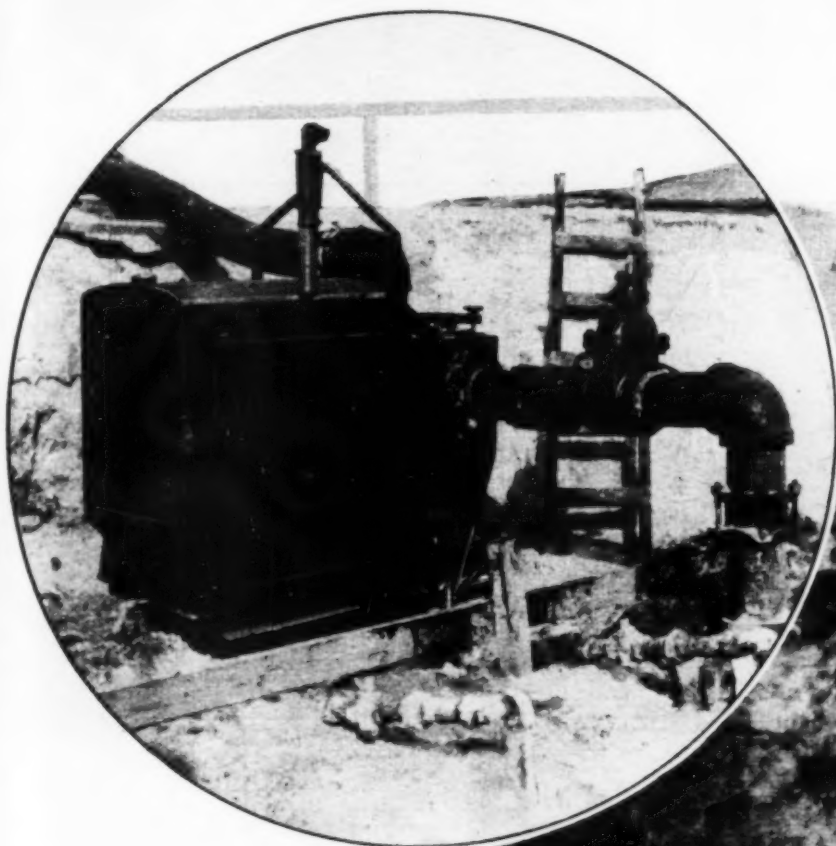
Couse & Sanders, contractor of Detroit had the job of putting in the disposal plant at Ludington, Michigan. Excavation was in sand 22' below Lake Michigan's level — lake only 200' away. Digging in the free flowing, water bearing sand with a large brick building only 20' from hole. These were the conditions encountered where the Novo standard 6" Self Priming Centrifugal Pump was installed to dewater the 80 wellpoints around the excavation. The slightest delay or shut down of pump would have spelled disaster.

Not only was there a possibility of the hole filling up, in which the contractor had \$15,000 invested, but also of the adjacent building sliding into the hole.

Photos below show the installation, depth of excavation and proximity of building.

This is another demonstration of the ability of the standard Novo pump to handle wellpointing under the most trying conditions.

Write for full information on Novo Pumps.



NOVO ENGINE CO.

The Austin-Western BADGER



The Austin-Western RoadM



ERbuilt for

peak output at lowest power cost

TALK with Badger operators and owners . . . They'll tell you it's the greatest performer they've ever known.

P. C. Roth, Brainerd, Minnesota, writes . . .

"We started to load, and the very first day we loaded 1,200 ton in ten hours. This is no guess work as every pound of gravel was weighed. This was no record either. One day we loaded 1,600 ton in 10 hours; one night, 1,400 ton in 10 hours."

"My oldest Badger Shovel, over one year old, has handled 350,000 tons of tailings and the total for repairs has not exceeded \$100.00. We have loaded as much as 120 tons of rock in one hour." . . . Huron Horine, Picher, Oklahoma.

"I found in addition to being applicable to all kinds of work, it is much faster than the Full-Swing type machine." . . . Earl Mitchell, Commissioner, Precinct No. 1, Tarrant County, Texas.

Faster Start—Swing—Stop . . . Lower Operating Costs.

Watch the Badger in action. You can see it's fast.

As it digs a full half yard struck measure, you can be sure there's no excess weight "dead heading," on the swing . . . requiring extra power to maintain high operating speed—boosting fuel bills and operating expense; for only the boom, dipper, and dipper stick, move with each swing and these are made as light as possible with extra strength alloy steels.

The Badger stands up in hard digging and has a 10,000 pound single line pull on a three part line. Low center of gravity and correct weight distribution permit this extra digging power.

Replace your slow-type shovel with a 3/4 swing Badger. Increased output and operating economies will make it a profitable investment.

Other Badger Features: Fully roller bearing equipped—convertible to crane, clamshell, dragline, pile driver, etc.—portable at truck speeds on trailer or its own wheel mounts—Diesel or gasoline power.

THE AUSTIN-WESTERN ROAD MACHINERY CO.
AURORA, ILLINOIS

and Machinery Co.

THE AUSTIN-WESTERN ROAD MACHINERY CO., A-6, AURORA, ILL.

- | | |
|--|--|
| <input type="checkbox"/> Send a salesman. | <input type="checkbox"/> Crushing & Washing Plants |
| <input type="checkbox"/> Tell me more about the: | <input type="checkbox"/> Elevating Graders |
| <input type="checkbox"/> Badger Shovel | <input type="checkbox"/> 5 Yd. Scraper |
| <input type="checkbox"/> Motor Grader | <input type="checkbox"/> 12 Yd. Scraper |
| <input type="checkbox"/> Roll-A-Plane | <input type="checkbox"/> Bituminous Distributors |
| <input type="checkbox"/> Blade Grader | |
| <input type="checkbox"/> Motor Sweeper | |
| <input type="checkbox"/> Trail Cars | |

Name _____

Address _____

City _____

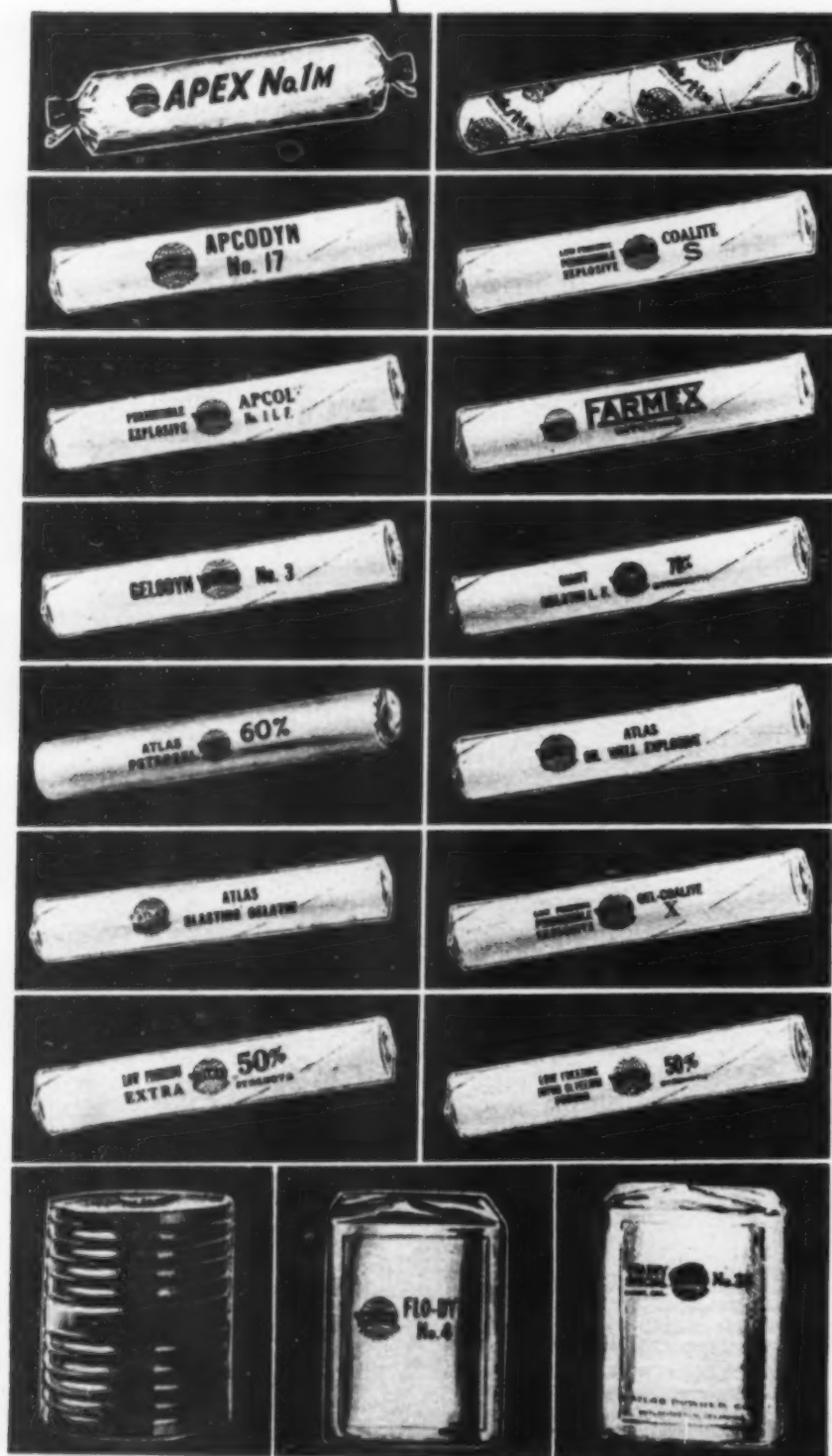
State _____

5H152

Maintaining the Pace

1937

celebrates the 25th Anniversary of the incorporation of the Atlas Powder Company. Some of its divisions date back much further than that,—The Giant Division, for example, dates back to 1868 as the first to manufacture dynamite in America.



RARELY is progress in improving products sensational. Only occasionally does a new product flash into the industrial firmament to become a fixed star. Developments which become standard practice evolve from steady painstaking improvements in products and production. Such developments maintain the pace.

Service needs in the field point the way to these developments. For 25 years, Atlas men in the field have been first to recognize the needs for better explosives and methods in the use of "controlled force." And for 25 years, every department of the Atlas Powder Company has concentrated on pioneering better methods—and better products.

25 years of experience—25 years of experiment—25 years of laboratory and field research have enabled Atlas to provide the right explosive for every type of blasting.

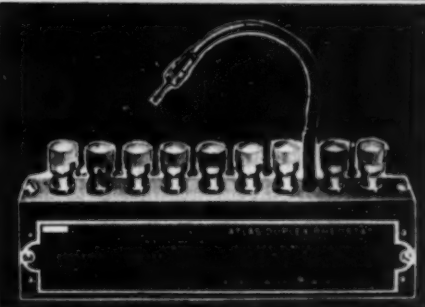
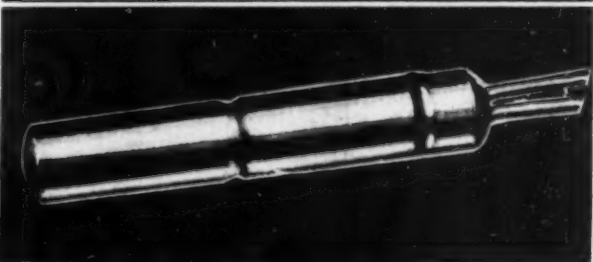
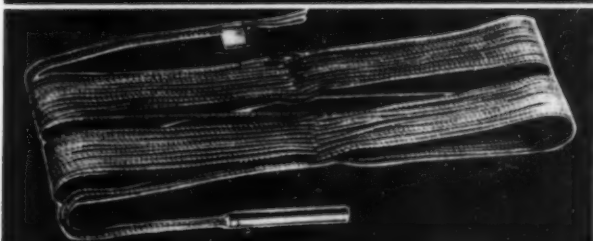
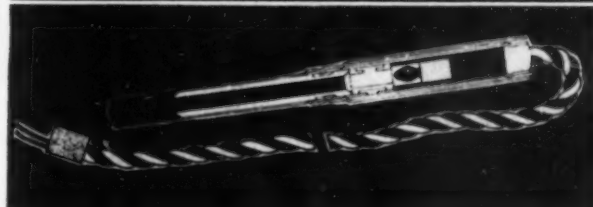
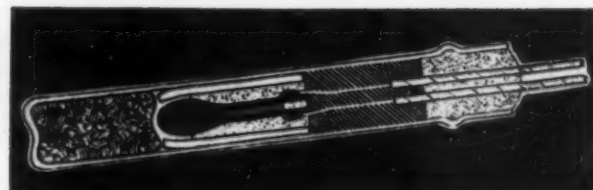
For 25 years, Atlas innovations have set the pace. The remark "You bought it first from Atlas" is appli-

for 25 years

cable to a surprising total of blasting products—both explosives and accessories.

Today—Atlas explosives and Atlas Blasting Accessories are standards of modern practice in applying “controlled force” to the fields of production. Atlas provides the right explosive for every job,—and the right accessories for methods that bring the most effective results from blasting.

Illustrated on these pages are some of the Atlas products which help maintain the pace. Many of them are Atlas “Firsts.” And with all Atlas products go the assistance of Atlas representatives,—qualified by years of cumulative experience in developing effectiveness and economy in blasting operations.



OTHER ATLAS PRODUCTS INCLUDE

**ZAPON
INDUSTRIAL
FINISHES**

**ZAPON
COATED
FABRICS**

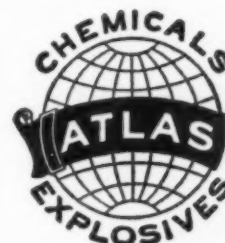
**DARCO
ACTIVATED
CARBONS**

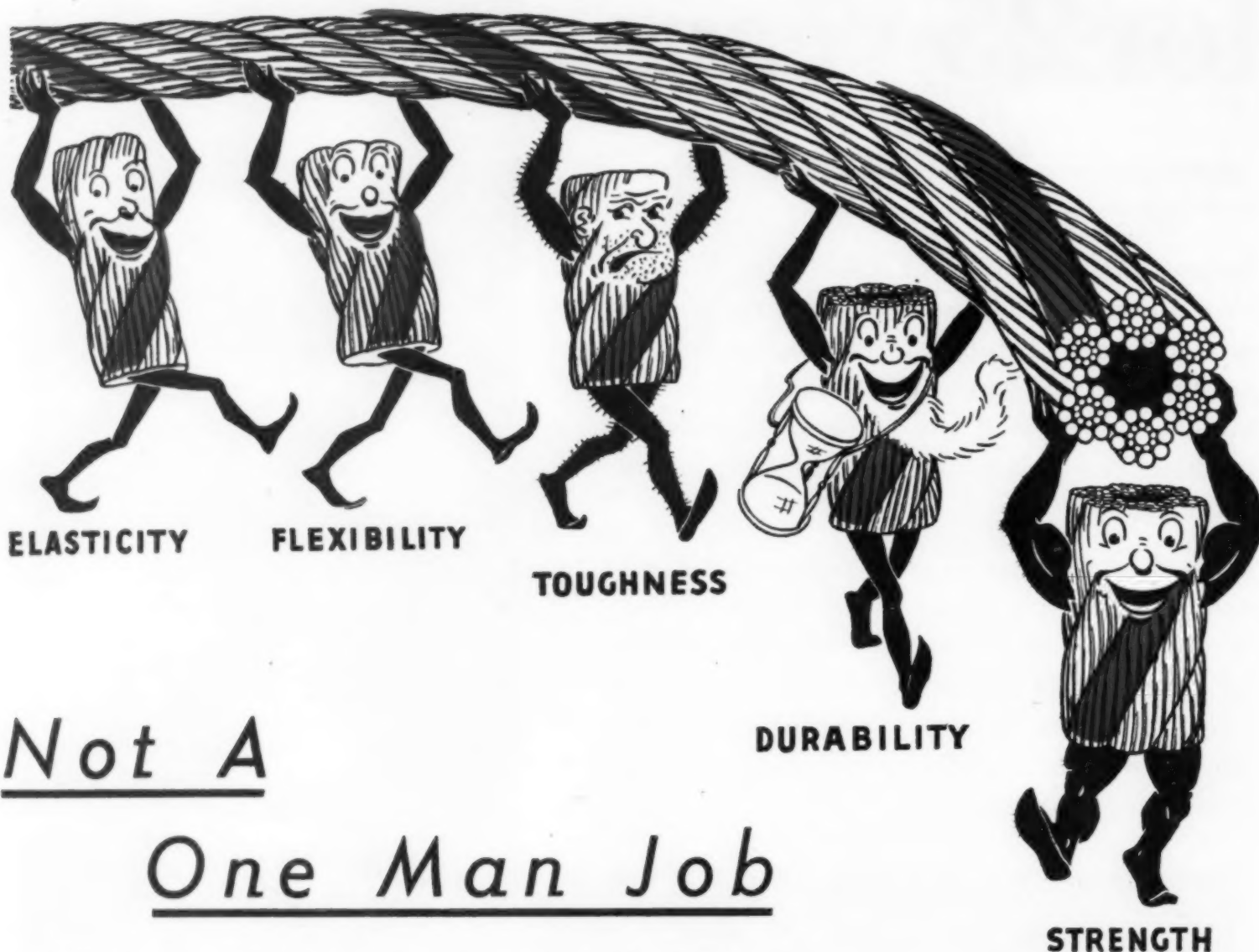
**ATLAS
INDUSTRIAL
CHEMICALS**

ATLAS

POWDER COMPANY

Wilmington, Delaware





Not A

One Man Job

It takes team work in wire rope to carry the loads of today. Enormous pulls, high speeds, sharp bends, sudden jerks and severe wear are some of the conditions encountered.

The consistently dependable performance of "HERCULES" (Red-Strand) Wire Rope is due to the fact that it is correctly balanced in all vital qualities. In other words, it has what it takes to provide safe and economical service—which has been proved by its performance record.

And the manufacture of such a wire rope is not a matter of chance. It is the result of firm policies, skilled engineers, experienced workmen, modern equipment, steadfast determination, and our eighty years of manufacturing experience. Why not give this time tested wire rope a chance to demonstrate to you its money saving ability?

▲ ▲ ▲

No one style or construction of wire rope is suitable for all conditions or kinds of equipment; for which reason we make "HERCULES" (Red-Strand) Wire Rope in a wide range of constructions and types, including Round Strand, Flattened Strand, Steel Clad, Non-Rotating and Preformed. If you will tell us how you use wire rope, we shall be glad to suggest the construction we consider best for your work.

▼ ▼ ▼

Made Only By **A. LESCHEN & SONS ROPE CO.** Established 1857

5909 Kennerly Avenue, St. Louis, Mo.

New York 90 West Street
Chicago 810 W. Washington Blvd.
Denver 1554 Wazee Street

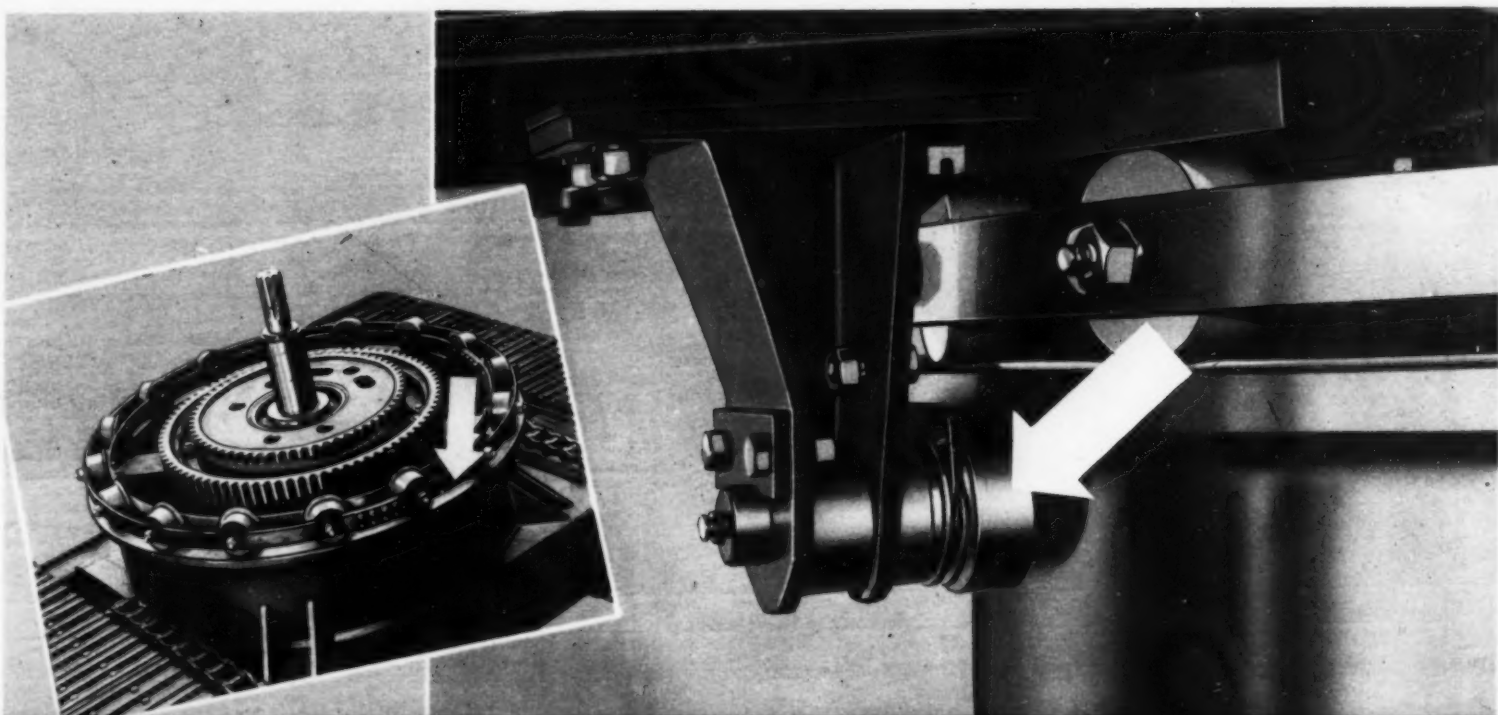
San Francisco 520 Fourth Street
Portland 914 N. W. 14th Avenue
Seattle 2244 First Avenue South



Save time on the swing and you'll see a big difference in your yards per day with one of these new P&H Pacemakers.

J. R. BOHANON
J. CROWLEY

HOW WE GET *this free and easy swing*



P&H Pacemakers-FASTER ON THE JOB

● Here's common-sense design—an upper revolving structure that rides on a huge roller bearing. There is no rocking under heavy dipper loads because these hook rollers counteract all tipping strain, eliminate pull on the center pin—keep all rollers in contact at all times. Wear is evenly distributed—swing is easier and faster to cut your dirt-moving costs. There's a P&H Pacemaker for every size job. For information address the Harnischfeger Corp.
4494 W. NATIONAL AVENUE MILWAUKEE, WISCONSIN



HARNISCHFEGER

CORPORATION

EXCAVATORS • ELECTRIC CRANES



HOISTS • MOTORS • ARC WELDERS



Manasquan River Bridge, between Brielle and Manasquan. Bridge Engineer N. J. State Highway Dept., Morris Goodkind. Contractor, Linde-Griffith Cons. Co., Newark, N. J.

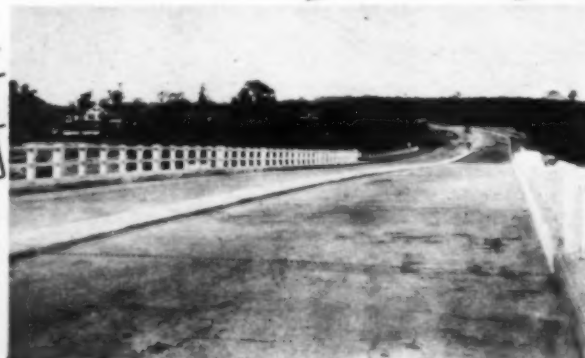
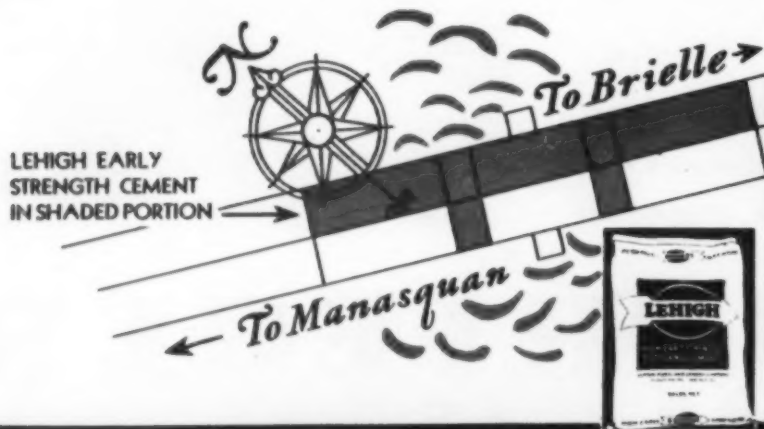
Saved TIME-MONEY

The contractor chose the quicker way! 28 days—half the number of forms—reduced operating costs;—these were some of the advantages to Linde-Griffith Construction Company.

New Jersey State specifications require horizontal slab forms in place 21 days for concrete made with normal portland cement; with early strength cement form removal is permitted in 7 days. By using Lehigh Early Strength Cement for one panel, construction time was reduced 14 days on each end of the bridge—quick service concrete allowed shifting forms from one side to the other, cutting form cost in half. It provided working base for pouring other slabs—materials for drawbridge were trucked over it;—such efficiency reduced operating costs and eliminated overhead expense for 28 days.

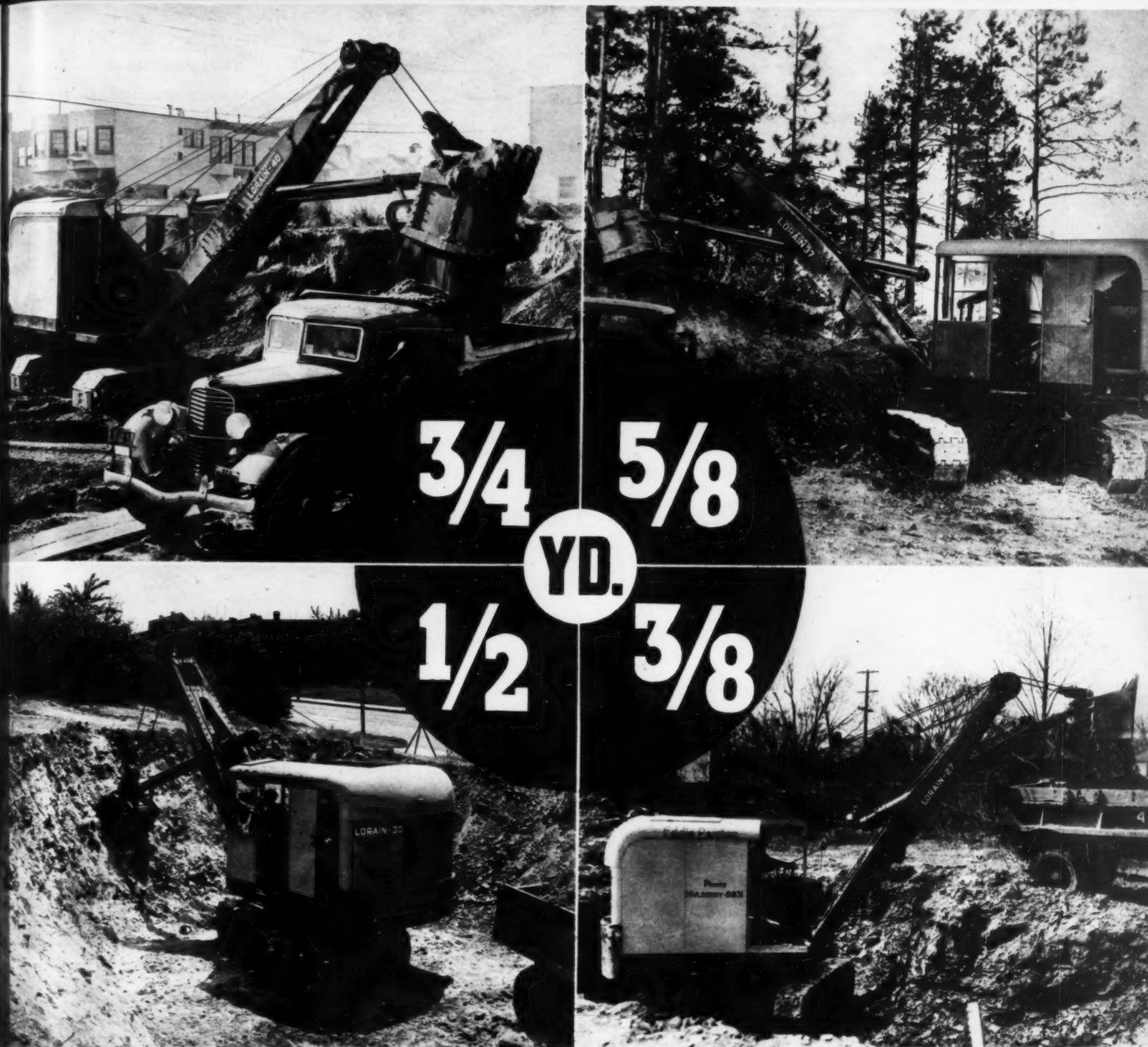
Results prove Linde-Griffith's choice was wise on the Manasquan River Bridge, the gateway from the South to the shore resorts of Monmouth County, N. J., route No. 34. Whether it's a bridge, a building job, or any other engineering construction, figure on Lehigh Early Strength Cement. It may expedite the whole job and drastically reduce costs. Compared with normal portland cement, it makes better concrete three to five times faster. Informative literature will be sent on request.

LEHIGH PORTLAND CEMENT COMPANY, Allentown, Pa., Chicago, Ill., Spokane, Wash.



Manasquan River Bridge looking toward Manasquan

LEHIGH EARLY STRENGTH CEMENT



THEY DUG THEIR WAY TO THE TOP

Lorain 40-37-30-27's attained their present acceptance by literally digging their way into contractors' confidence. Shattering performance records right and left, these versatile machines proved conclusively that Capacities do depend on Stability and Strength, not Weight—started a new trend in shovel and crane design which others are following today. • Every feature of Lorain



design has been tested by hundreds of contractors who judge machines solely on their ability to turn dirt into dollars. The best evidence of their findings is the fact that two out of every five Lorain sales are repeat orders. • So why stake your dollars on a machine which has yet to prove itself? Lorains have already proved their ability to increase production and profits.

UNIVERSAL CRANE DIVISION

THE THEW SHOVEL COMPANY

LORAIN, OHIO

LORAINS

Production is like a dredge chain.



● When a broken link puts your dredge chain out of action, production halts. It's much the same with mining operations below ground. A break-

down at your primary crusher or at the mill ties up production all along the line. But these costly delays seldom happen when tough, strong, enduring alloys of Nickel are employed for essential parts of key machinery. When you consider the money saved by preventing costly hold-ups, the Nickel Alloys are the cheapest materials in the end.

CAST IRONS
NICKEL
ALLOY STEELS

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.



**UP HERE WE SPECIFY
"VENTUBE" VENTILATING DUCT
BECAUSE IT SAVES TIME
AND MONEY ON TUNNEL JOBS!**

IT'S significant to note that on some of the biggest, record-breaking jobs, Jute "Ventube" has been the ventilating duct used. On both the Los Angeles water supply and the Twin Lakes projects, records for tunnel driving were made. Today, "Ventube" is helping speed the work on New York City's Delaware Aqueduct.

Engineers specify "Ventube" because it works fast, saves man-hours and labor costs, assures an abundant supply of fresh air. Even on difficult jobs a whole system of flexible "Ventube" can be hung in a short time. Sections fasten securely in air-tight joints in a few seconds. During blasting, those nearest the working face slide back quickly and easily. When finished, "Ventube" can be rolled up and carried to the next job.

Jute "Ventube" is made of extra-heavy, long-fibered Hessian cloth — *coated and impregnated with resistant rubber*. It is the strongest, toughest tubing on the market. Tear resistance is as great in the warp as in the filler. Not even concussion can rip "Ventube," nor will acid water, rot, or fungus harm it in any way.

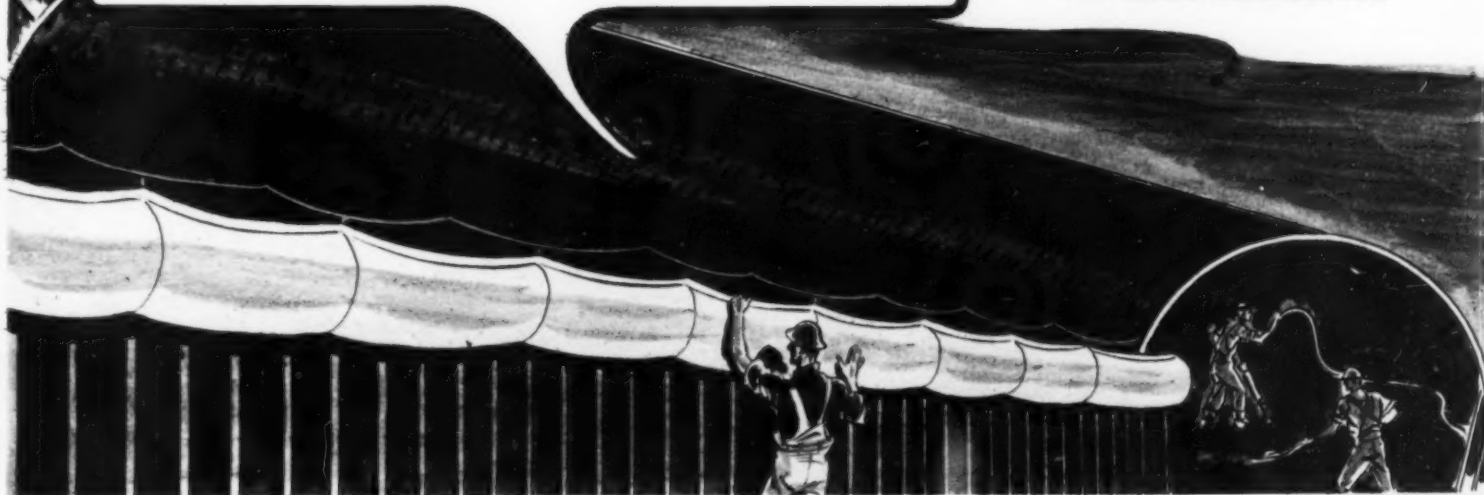
The best test for "Ventube" is actual use under difficult conditions. Install a few sections on one of your hardest jobs. A single trial will convince you of its unusual durability and ease of handling. For quick service, distributors are located within easy reach.

E. I. DU PONT DE NEMOURS & CO., INC.
"FABRIKOID" DIVISION
FAIRFIELD, CONNECTICUT

**DOWN HERE WE WANT "VENTUBE"
BECAUSE IT'S EASIER TO INSTALL AND MOVE
...ASSURES A SAFE SUPPLY OF FRESH AIR!**



THE FLEXIBLE VENTILATING DUCT

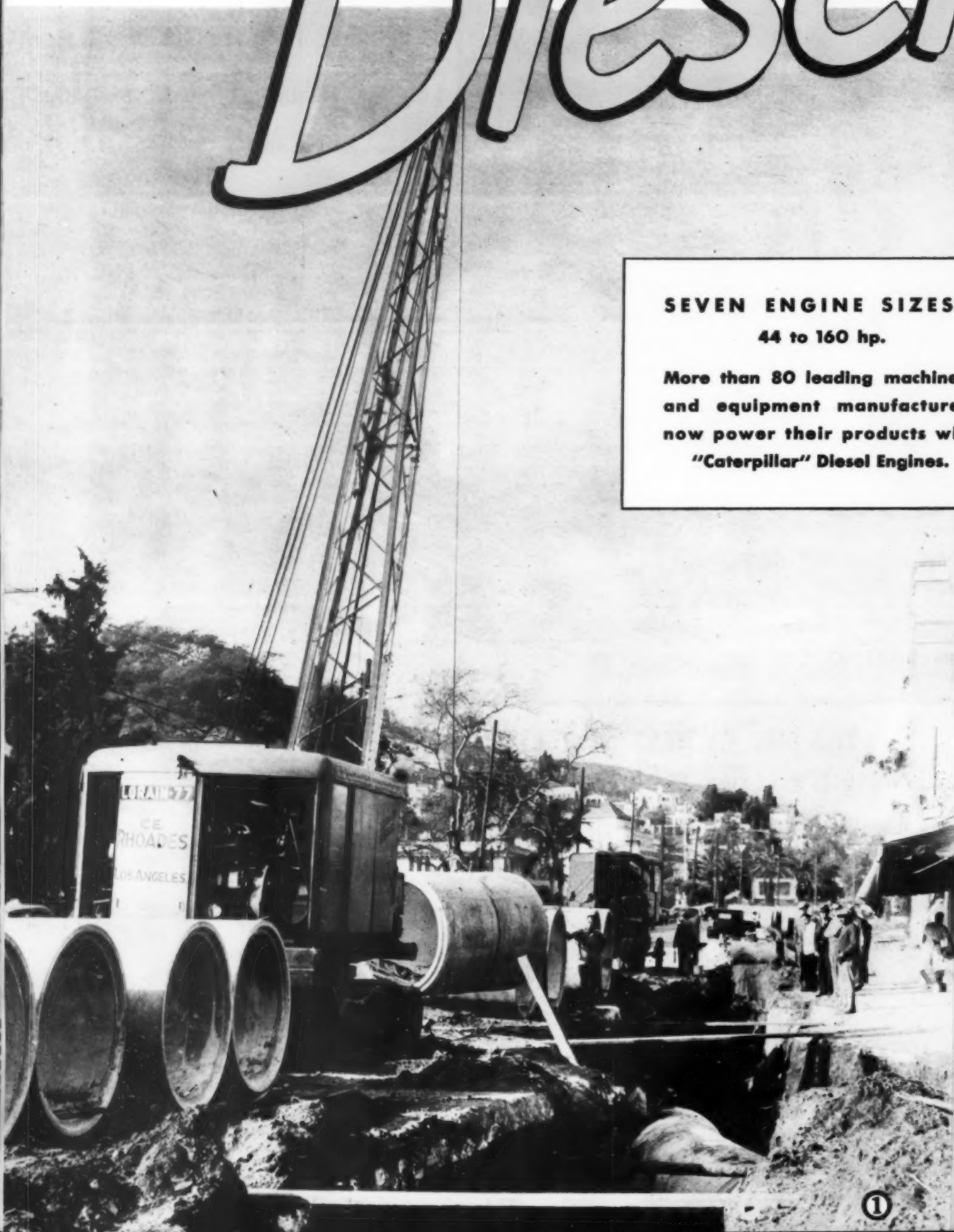


"CATERPILLAR"

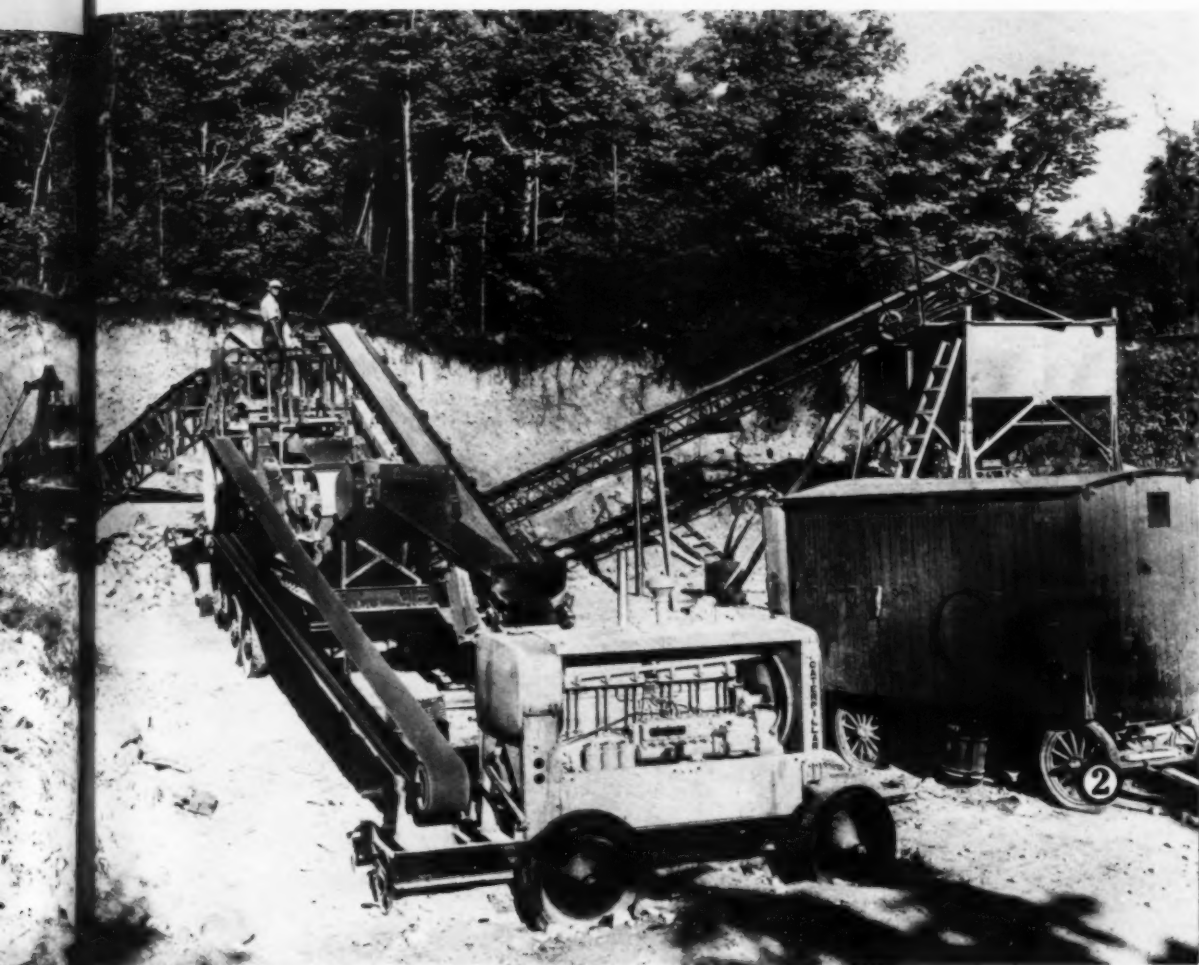
Diesel...

**SEVEN ENGINE SIZES—
44 to 160 hp.**

**More than 80 leading machinery
and equipment manufacturers
now power their products with
"Caterpillar" Diesel Engines.**



AN ALL-ROUND PERFORMER!



① A LORAIN WORKING AT CLOSE QUARTERS

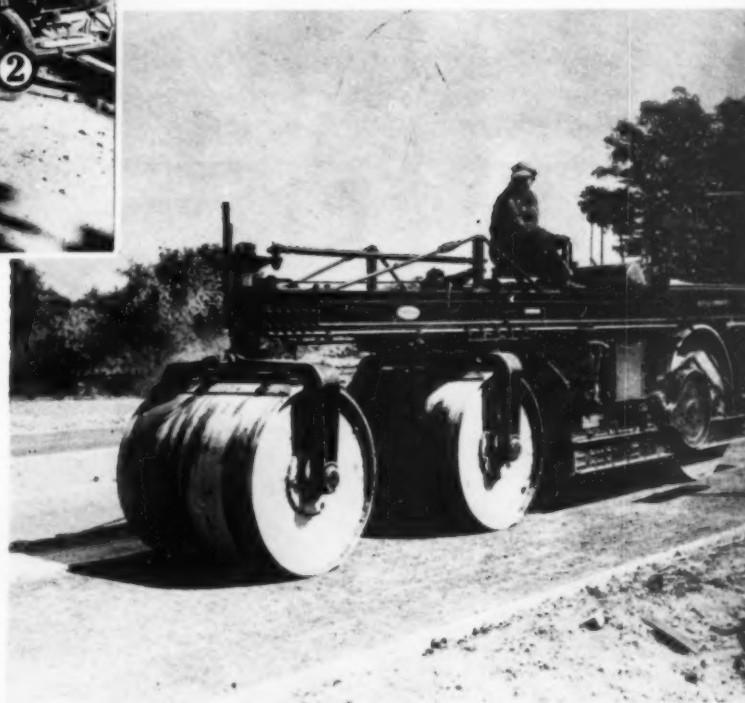
This Thew-Lorain had to dodge overhead lines and other obstacles on a drain construction job along this busy Los Angeles street. The flexible and responsive power required was supplied by a "Caterpillar" Diesel Engine. The equipment excavated the ditch with dragline bucket, and then, used as a crane, swung the sections of concrete drain pipe into place.

② PIONEER CRUSHING PLANT IN WISCONSIN

The sure way to turn out construction material at lowest cost is to drive the plant with a "Caterpillar" Diesel Engine. This rock crushing and screening machinery, made by the Pioneer Gravel Equipment Co., and owned by the County of Washington, is operated by a D11000 engine which consumes only 3½ gallons of 7½c Diesel fuel per hour.

③ A BUFFALO-SPRINGFIELD ON A CALIFORNIA HIGHWAY—A "Caterpillar" Diesel Engine

furnishes the driving power for this 13-ton, 3-axle tandem road roller. Another combination of good equipment contributing to the smoothness of California roads!

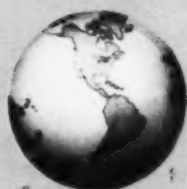


LIKE the athlete who's a champion at wrestling, weight throwing, Marathon running and in other events, "Caterpillar" Diesel Engines are star performers on all kinds of jobs where power is needed . . . establishing records for stamina, steady going, and low operating costs not even threatened by other types of power.

Outstanding are the standards of economy and low maintenance that these engines have set up in the construction field—in operating excavators, pumps, crushers, highway maintenance and other equipment. Literature, cost figures and engineering suggestions on any general or special use or installation are readily available—through our nearest dealer or direct from us.

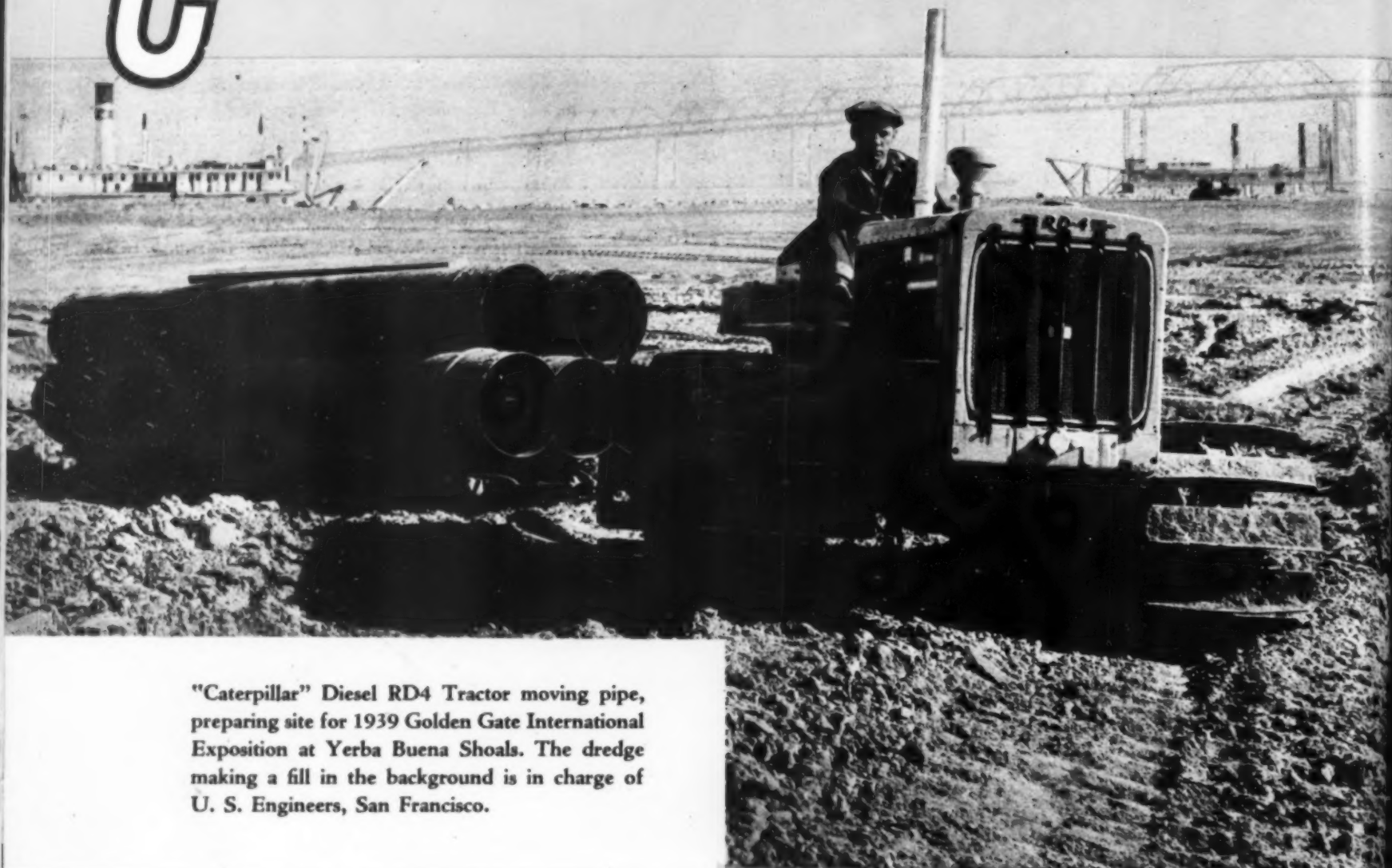
CATERPILLAR DIESEL ENGINES

REG. U.S. PAT. OFF.



CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS
WORLD'S LARGEST MANUFACTURER OF DIESEL ENGINES

"CATERPILLAR" DIESELS GO TO



"Caterpillar" Diesel RD4 Tractor moving pipe, preparing site for 1939 Golden Gate International Exposition at Yerba Buena Shoals. The dredge making a fill in the background is in charge of U. S. Engineers, San Francisco.



"Caterpillar" Diesel RD7 Tractor equipped with bulldozer doing its stuff at Flushing Meadows, Long Island, getting ready for New York's coming fair. This tractor is on the job 24 hrs. a day, using 20 to 25 gals. of low-cost fuel per 8 hrs.

NO EXHIBITIONISTS, these. When they go to a World's Fair, they go to *work*... not merely to show off in a beribboned booth. Whether it's to break ground for a new international exhibit or to "replace the turf" after one that has closed, these products get in there and BITE, keep things moving, keep construction costs DOWN. Dams, canals, roads, fairs—all's "fair" to the "Caterpillar" Diesel. Mail the coupon for the new book, "On Construction Jobs with 'Caterpillar' Diesel Products."

TO WORLD'S FAIRS IN OVERALLS

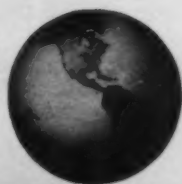
Bucyrus-Erie shovel equipped with "Caterpillar" D11000 Engine excavating, ripping up drives, concrete walks and foundations in Chicago's Century of Progress grounds, preparatory to restoring landscape for park purposes. Engine reported to use 20 gals. of 6c fuel per 8-hr. day.



CATERPILLAR

REG. U.S. PAT. OFF.

TRACTOR CO., PEORIA, ILL.



WORLD'S LARGEST MANUFACTURER
OF DIESEL ENGINES, TRACK-TYPE
TRACTORS AND ROAD MACHINERY

Clip and Mail This Coupon Now

CATERPILLAR TRACTOR CO., Peoria, Illinois
Gentlemen: I'd like to read your book, "On Construction Jobs
with 'Caterpillar' Diesel Products."

My name _____

My firm _____

My position _____

KEEP YOUR COSTS DOWN WITH *LaPlant-Choate* **ROADBUILDERS**

**HIGHLY
PERFECTED
TO MEET
MODERN
REQUIREMENTS**



There is a LaPlant-Choate Roadbuilder for every type of road building work. Built exclusively for use on "Caterpillar" track-type tractors. This assures you balanced performance and fine service facilities from any of the hundreds of "Caterpillar" dealers throughout the country. For complete information, contact your nearest "Caterpillar" dealer or write direct to the manufacturer.

More than ever before, your roadbuilding equipment must be geared to the speed, dependability, efficiency and economy required by today's contracts. LaPlant-Choate Roadbuilders are highly perfected to meet every demand made of them. Easy to operate, thoroughly reliable, built to stand up under the hardest kind of jobs, this equipment will not only do the work the way you want it done, but will save you money. Finger-tip hydraulic operation gives the operator positive control at all times. No tricky, complicated mechanism to cause trouble, delay and expense. These Roadbuilders operate in the simplest, most direct manner possible. LaPlant-Choate pioneered this type of equipment and from years of experience have developed the finest and most completely satisfactory Roadbuilder on the market.

TAMPING ROLLERS
SCRAPERS • BULLDOZERS

LA PLANT-CHOATE

RUBBER WHEELED WAGONS
BRUSH CUTTERS • SNOW PLOWS

MANUFACTURING CO. Inc.

CEDAR RAPIDS, IOWA.



HAULING COSTS TAKE A DIVE

SINCE ATHEY FORGED-TRAK 2-WAY DUMP TRAILERS ENTERED THE PICTURE

● Marquette Cement Company, at Oglesby, Ill., is moving 450,000 yards of overburden to uncover stone to be used in making cement. Using Athey Forged-Trak 2-Way Dump Trailers, hitched to "Caterpillar" Diesel Tractors, their hauling costs are substantially lower than ever before. What's more, the capacity of the loading unit has been increased 50% because easy-to-spot 2-Way Trailers allow a faster, shorter swing of the dipper. Whether you're handling dirt or rock, Athey Forged-Trak 2-Way Dump Trailers can reduce hauling costs. See your "Caterpillar" dealer, or write us direct.

ATHEY TRUSS WHEEL CO.
5631 WEST 65th STREET • CHICAGO, ILLINOIS
CABLE ADDRESS: "TRUSSWHEEL" CHICAGO

ATHEY
Forged-Trak
REG. TRADE MARK

**2-WAY
DUMP TRAILERS**

GOOD MUDDERS

LeTOURNEAU CARRYALL SCRAPERS

ACTUAL
JOB DATA

AT SARDIS DAM



LeTourneau U-12 Carryall Scraper being loaded by a Lorain 1-Yard Dragline at Sardis.

(Below) U-12 Carryall going through the spongy fill where other equipment bogged down.

U-12 Carryall and "Caterpillar" RDB loading muddy clay from the borrow pit.



Down in the wet clay of Sardis Dam, Mississippi, Fred Hooper (Hooper Construction Company), LeTourneau fleet user, has a million yards of excavation to move in 150 days. When his hauling equipment stuck in the spongy fill, he loaded LeTourneau U-12 Carryall Scrapers with a dragline, used them as hauling units. until their big 18.00 x 24 tires had compacted the fill sufficiently to make it passable for conventional wagons and trucks. Then they went back to loading themselves, continued hauling, spreading and compacting the fill so other equipment might work. Thus at Sardis Dam, LeTourneau Carryalls showed themselves good mudders, definitely proved they will go where ordinary equipment finds the going too soft.

If you have a mud job, ask your "Caterpillar" dealer to demonstrate what LeTourneau equipment will do.

★ Job observed and data certified by our Promotional Engineering Department. You are invited to call on this Department for aid in estimating and planning the best methods of handling your earth-moving problems.

LETOURNEAU

R. G. LeTOURNEAU, INC., • Peoria, Illinois • Stockton, California • Cable Address: "Bobletorno"

Manufacturers of: Angledoosers*, Buggies*, Bulldozers, Carryall* Scrapers, Cranes, Drag Scrapers, Power Control Units, Rooters*, Treedoosers.

*Name Registered U. S. Patent Office.

The Prest-O-Weld W-105A Outfit

... includes the standard Prest-O-Weld blowpipe for general welding and heavy heating operations, oxygen and acetylene regulators, hose and other equipment as illustrated here. It will pay you to inspect this outfit at your jobber's, and notice especially the "10-second" Detachable Valve Body—an exclusive Prest-O-Weld feature.

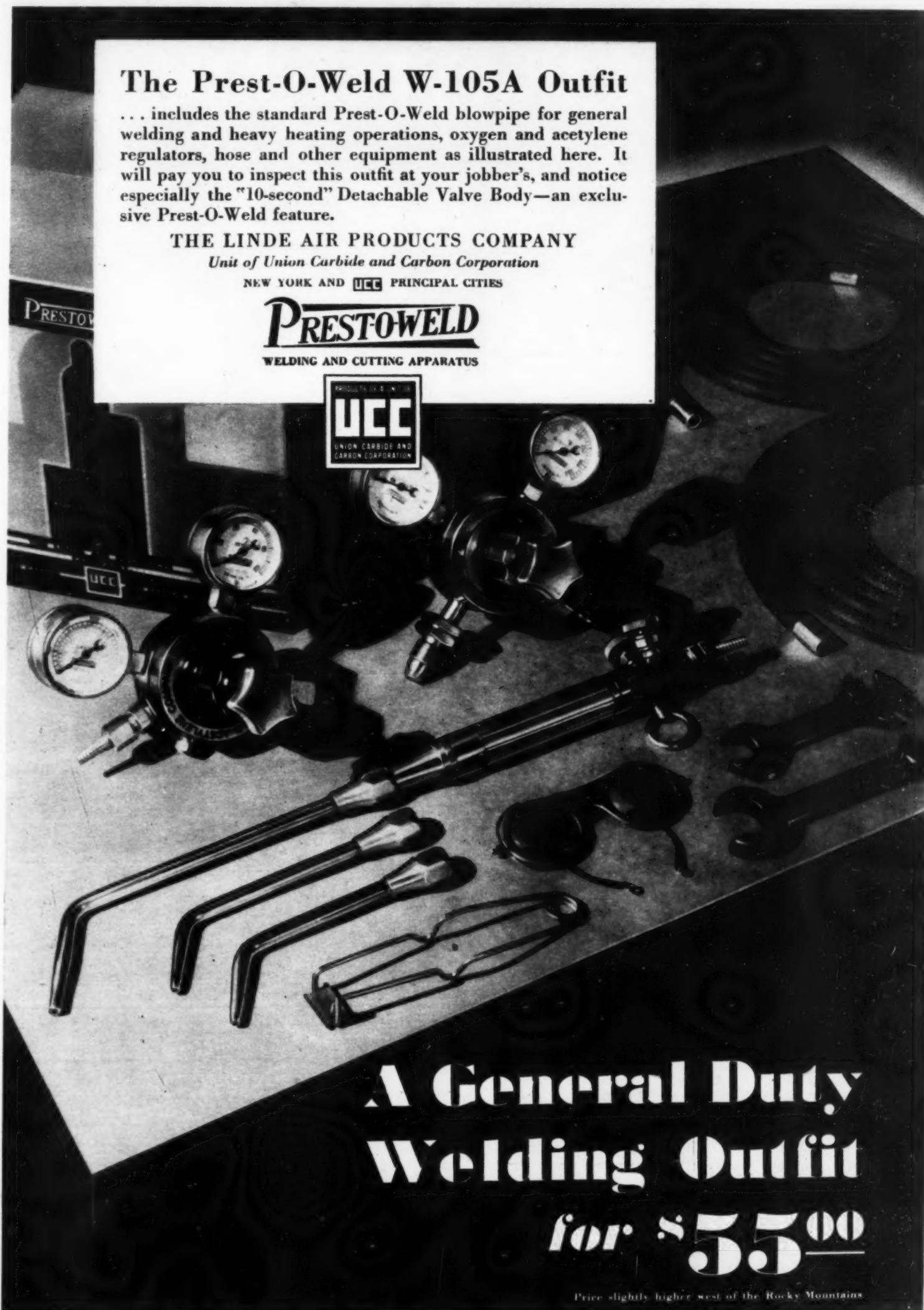
THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

NEW YORK AND UCC PRINCIPAL CITIES

PRESTOWELD

WELDING AND CUTTING APPARATUS



A General Duty Welding Outfit for \$55⁰⁰

Price slightly higher west of the Rocky Mountains

Another Bucyrus-Erie for **FOLEY BROTHERS**

a total of

48



**BUCYRUS
ERIE**

Bucyrus-Erie Co., South Milwaukee, Wis., U. S. A.
Two of Every Three Sales are Repeat Order

986

*The B-G
Line*

PERMANENT
CONVEYORS

BUCKET
LOADERS

PORTABLE
CONVEYORS

DITCHERS

CARRIERS

SNOW
LOADERS

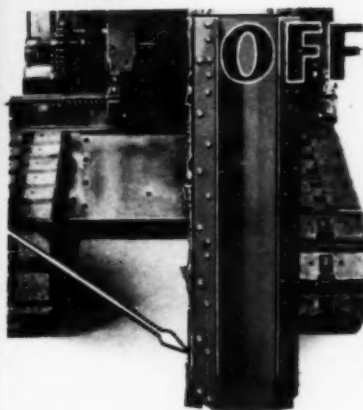
TRAVEL PLANTS

CENTRAL PLANTS

FINISHERS



with



OFF - SET Vertical Boom

The exclusive B-G Vertical Boom gives greater diggability on all B-G Ditchers. There is no ramp to clean out by hand at either end of the ditch. It digs right up to walks, curbs, etc.

With the Barber-Greene Utility Special, the boom is not only vertical, but can be quickly off-set to any point between the crawlers, giving the optimum in diggability.

The B-G Utility Special is driven through two transmissions, giving instant traveling or digging speed changes to suit any condition.

Full crawler mounting gives perfect maneuverability (it will turn around on a flat car).

Let us send you complete information on the B-G Utility Special, there is no obligation. Phone, wire or write.

Barber-Greene Company

530 West Park Avenue, Aurora, Illinois

The B-G Model 54 Utility Special available with booms for cutting 8" to 18" wide, 4' or 5' 6" deep. Ask about the Service Special, only 4' wide overall, for smaller work; the B-G Standard which goes to 8' 3" deep; or the Pipe Line Special for high speed cross country trenching.

Standardized Material
Handling Machines

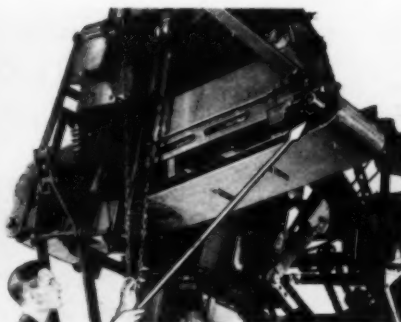
BARBER GREENE

37-9

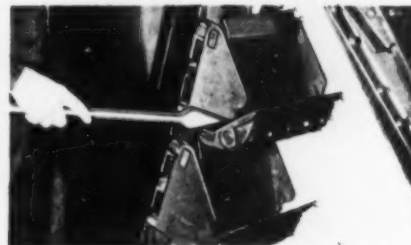
Automatic Overload Release. Automatically slips when buckets encounter overload. Automatically resets itself.



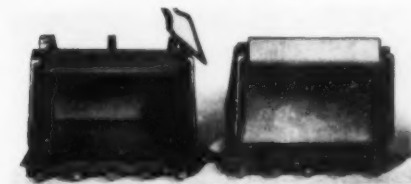
Conveyor quickly adjusted for discharge on either side. Distance of spoil bank easily controlled.



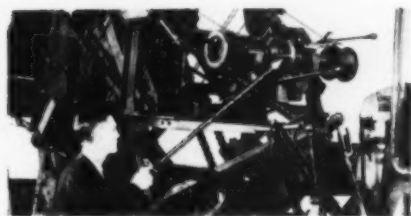
Simply turn this crank to off-set the boom. Can be off-set while digging.



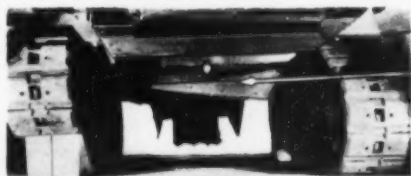
B-G Milling Action digging gives high capacity in easy going, and the ability to cut through the toughest material.



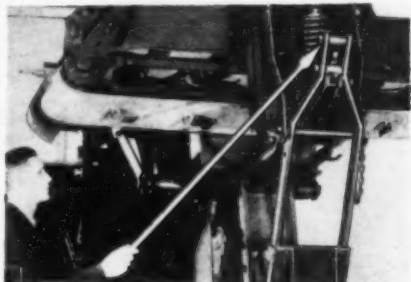
Self-Cleaning Buckets, Left: digging position. Right: Throw-out position. Manganese nickel alloy steel.



Simple, self-locking power boom hoist.

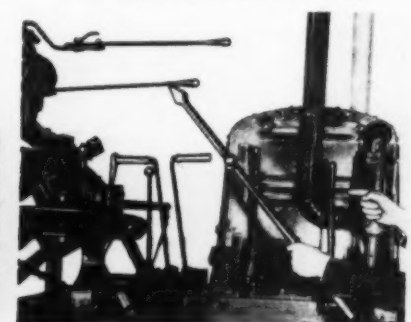


Oscillating axle. Ditcher remains on even keel over uneven surface.



Above: Automatic Self-resetting Overload Release for clean-up scraper.

Below: All controls centered for convenient, more efficient operation.



KOEHRING



PAVERS



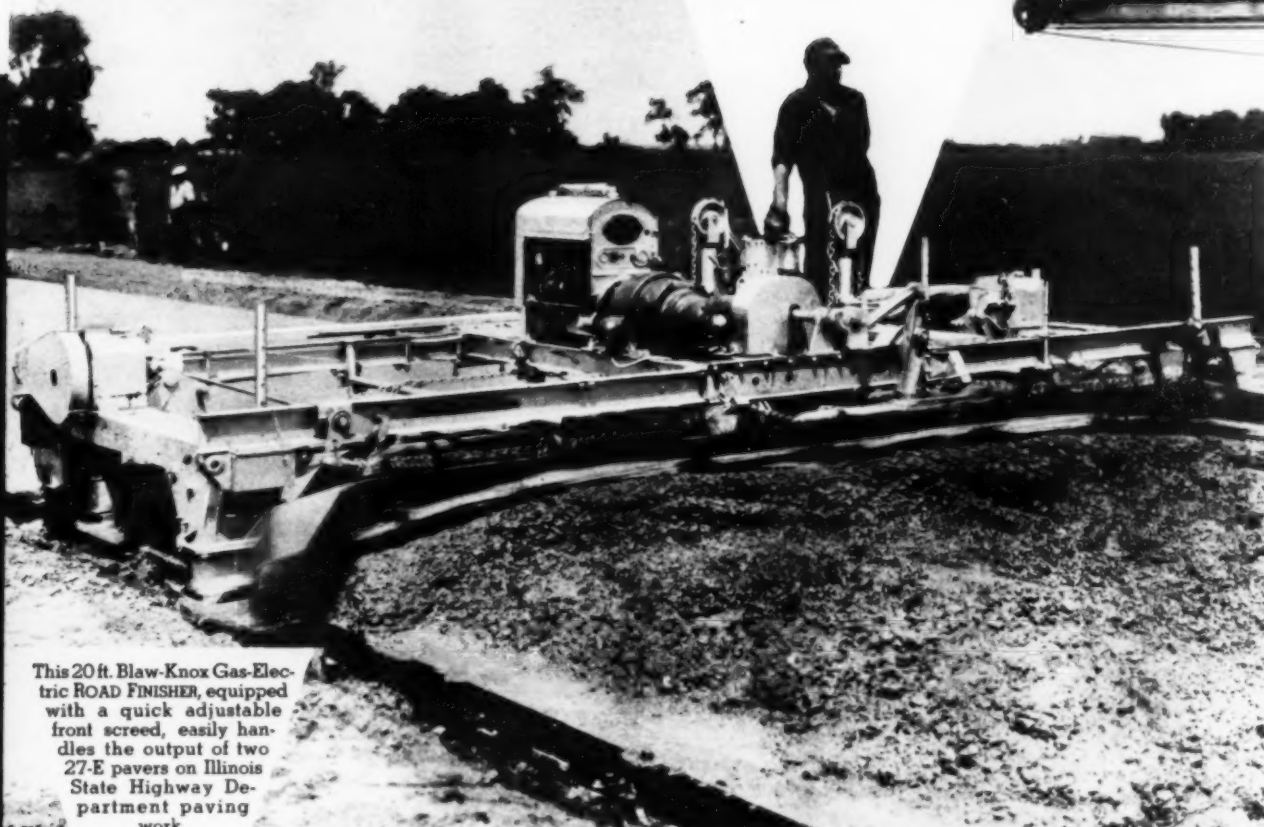
Write for bulletin illustrating
Koehring Pavers on concrete placing
projects other than highway work.

High speed production for the two course
concrete slab of this model double lane
super-highway project in northern Indiana
... Koehring Pavers were chosen by the
contractor, because of their established
and enviable reputation of high daily yard-
age and freedom from production delays.

KOEHRING COMPANY

Pavers · Mixers · Shovels · Cranes · Draglines · Dumpers · Mud-Jacks
3026 WEST CONCORDIA AVENUE, MILWAUKEE, WISCONSIN

This FINISHER is Stepping Right Along Behind Two Pavers



This 20 ft. Blaw-Knox Gas-Electric ROAD FINISHER, equipped with a quick adjustable front screed, easily handles the output of two 27-E pavers on Illinois State Highway Department paving work.

It's a **BLAW-KNOX** **GAS-ELECTRIC**

- **INVESTIGATE**—know the fine performance of the Blaw-Knox Gas-Electric Road Finisher for concrete and bituminous paving. Widespread use throughout the country is definite proof of the practical efficiency of the Blaw-Knox gas-electric principle.

Some of the advantages of the Blaw-Knox Gas-Electric Road Finisher are:

Rapid and easy adjustment of width.
More positive and smoother power and traction.
Greater accuracy of steering on the forms.
Easier on the road forms.
Faster; greater flexibility of speeds.

Removable flanges on traction wheels, for quick wheel changes.
Vibrator for joints can be plugged in on the finisher, eliminating the need of a separate generator.
Smoother and truer finish of slab.

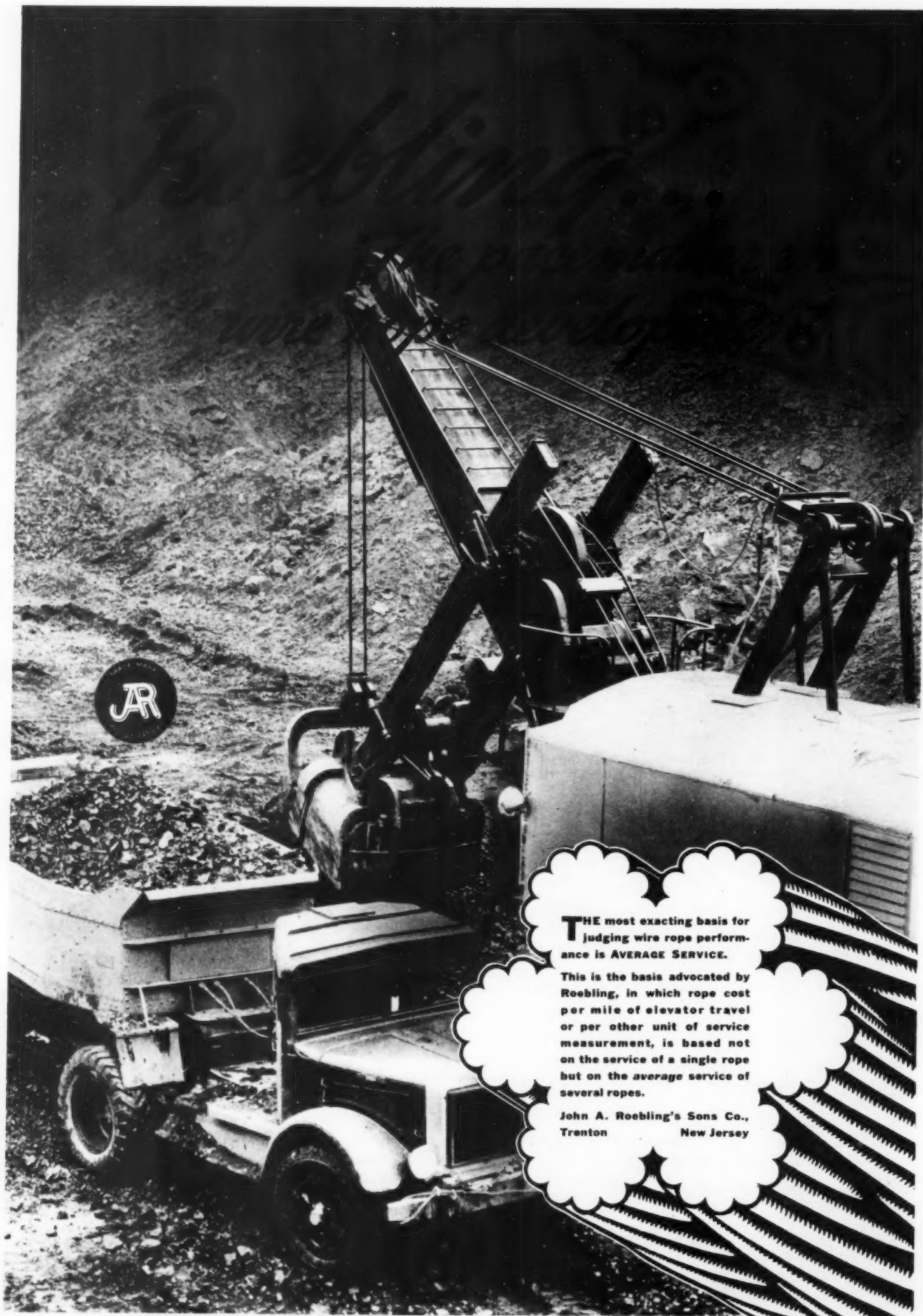
These and many other points of performance and convenience have been demonstrated conclusively in the field under a great variety of paving conditions.

If you wish further details of the Blaw-Knox Gas-Electric Road Finisher, send for Blaw-Knox Catalog No. 1507.

BLAW-KNOX COMPANY . . . PITTSBURGH, PA.

Offices and Representatives in Principal Cities

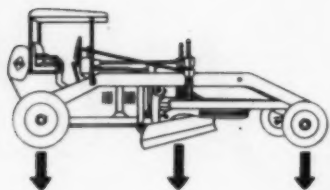




THE most exacting basis for judging wire rope performance is AVERAGE SERVICE.

This is the basis advocated by Roebling, in which rope cost per mile of elevator travel or per other unit of service measurement, is based not on the service of a single rope but on the average service of several ropes.

John A. Roebling's Sons Co.,
Trenton New Jersey



WEIGHT DISTRIBUTION MAKES THE Difference

The weight of Allis-Chalmers Speed Patrols is properly distributed between front and rear wheels. That is why they convert a higher percentage of their weight into blade pressure than any other motor graders.



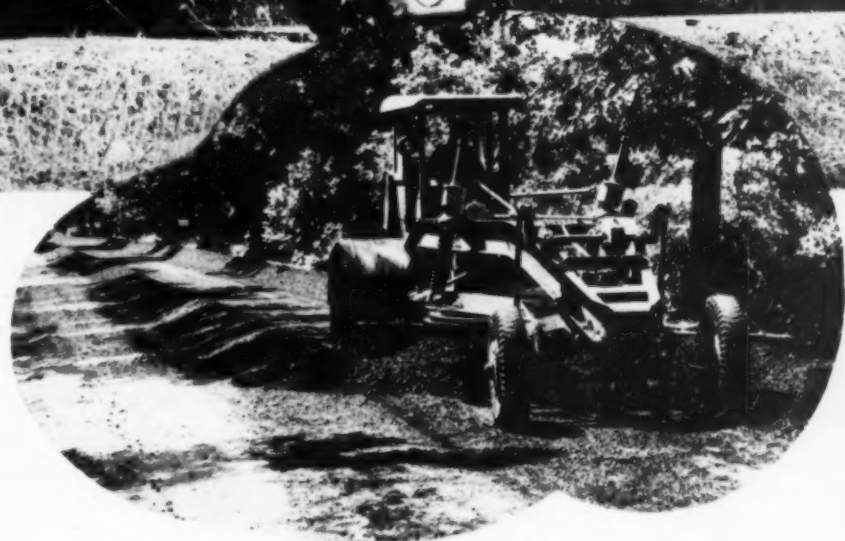
MODEL 54 SINGLE DRIVE SPEED PATROL

Ample power and speed for oil mix, grading, ditching, scarifying, construction, snow removal or maintenance. Powered by the unbeatable Model "K" engine.

No motor grader can take full advantage of its engine power or its traction—unless its **BALANCE** is right. Correct balance is absolutely essential to **EFFECTIVE BLADE PRESSURE** ... and blade pressure is essential to smooth, even work.

There are several reasons why Allis-Chalmers Speed Patrols convert a higher percentage of their weight into blade pressure than any other motor graders. Center mounting of the engine is important. Instead of prying upward **AGAINST** the blade ... the Speed Patrol engine's weight pushes downward **WITH** the blade—and in that way **INCREASES** blade pressure. Center engine mounting is the only design that distributes weight evenly between front end, blade and rear end.

Long wheel base and extra long blade base put the Speed Patrol's moldboard farther back from its



front axle—which also directs a greater percentage of the machine's weight into the blade. Greater front-end weight holds the Speed Patrol to the road, assures more effective work, and prevents side-slipping on heavy cuts. Only the correct weight distribution and balanced design of Allis-Chalmers Speed Patrols will give you the powerful, ground-gripping traction, tremendous blade pressures and positive steering you want and need. Get the facts!

ALLIS-CHALMERS SPEED PATROLS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

SINGLE OR TANDEM DRIVE.. NO. 42 AND NO. 54 SIZES.. GASOLINE, DISTILLATE, DIESEL FUEL OIL

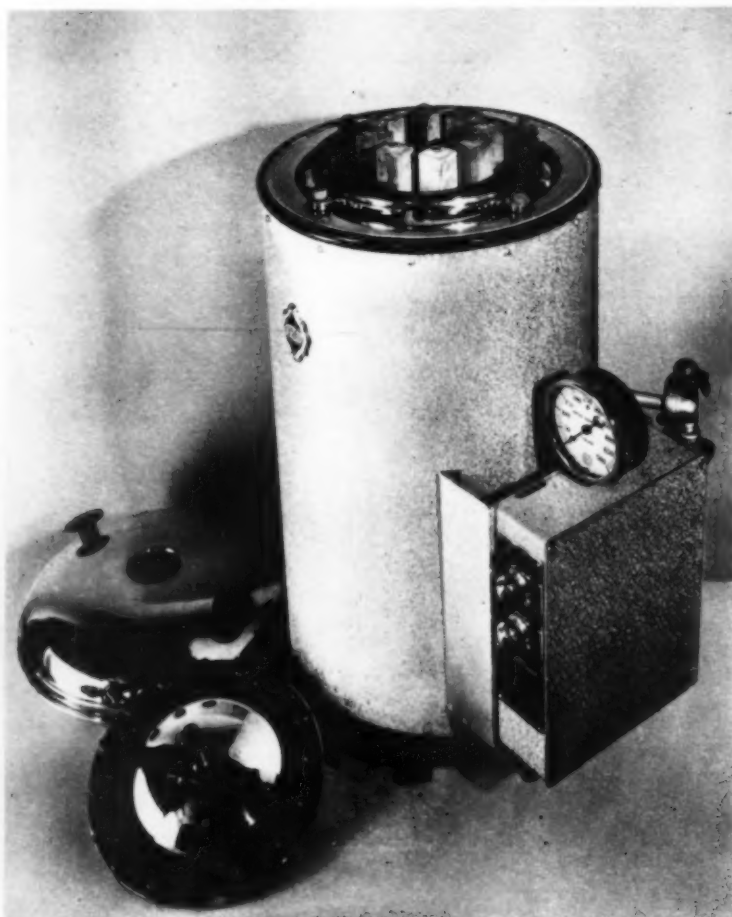


Hot?... *pooh*

It's 420° in the autoclave!



FREEZING MACHINE



AUTOCLAVE MACHINE

THESE dog days seem *cool* when you consider the terrific heat of the autoclave.

The autoclave is the machine shown above, at the right, in which accelerated soundness tests of cement are made. Cement bars are steamed at 420°F in order to detect potential expansion, if any, years before it would ordinarily occur.

In the freezing machine, tests at the other extreme are made. In this machine, concrete specimens are alternately frozen at a temperature of 15° below zero, and

thawed. The purpose is to determine in advance how the concrete will perform on the job under outdoor exposure.

This work is under the supervision of O. L. Moore, director of tests and research. Working with modern equipment, Mr. Moore directs literally millions of tests each year to insure a quality product.

The turbidimeter, using the "electric eye," makes fineness tests of cement. The modern moist cabinet cures cement mortar and concrete specimens for various

periods before testing at a temperature of 70°F and a relative humidity above 95 per cent the year round.

While many of the tests made are not required by government and other standards, we figure that by being extra careful about testing, we can be extra sure of unvarying quality.

UNIVERSAL ATLAS CEMENT CO.
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Universal Atlas

CEMENTS

Construction

Methods and Equipment

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ROBERT K. TOMLIN, Editor

Volume 19

August, 1937

Number 8

Three Bridges Win Beauty Awards

SELECTED to receive the stainless steel plaque of the American Institute of Steel Construction, designating them the most beautiful bridges built last year are:

EAST RIVER CROSSING, TRIBOROUGH BRIDGE, *New York City.*

HURRICANE DECK BRIDGE, *Lake of the Ozarks, Missouri.*

ASTORIA BOULEVARD BRIDGE, *over Grand Central Parkway Extension, New York City.*

These three bridges have been named by a jury of nationally known engineers and architects as the most beautiful bridges of monumental size, of medium size and of small span, completed and opened to traffic during 1936.

The Jury of Award consisted of: Harvey Wiley Corbett, of Corbett & MacMurray, architects, New York City; Leonard Schultze, of Schultze & Weaver, architects, New York City; Clarence W. Hudson, consulting engineer, New York City; Robert Ridgway, consulting engineer and former chief engineer of the Board of Transportation and department engineer, Board of Water Supply, New York City; and A. Lawrence Kocher, editor, "Architectural Record", New York City.

A more complete description of the prize bridges of this year follows:

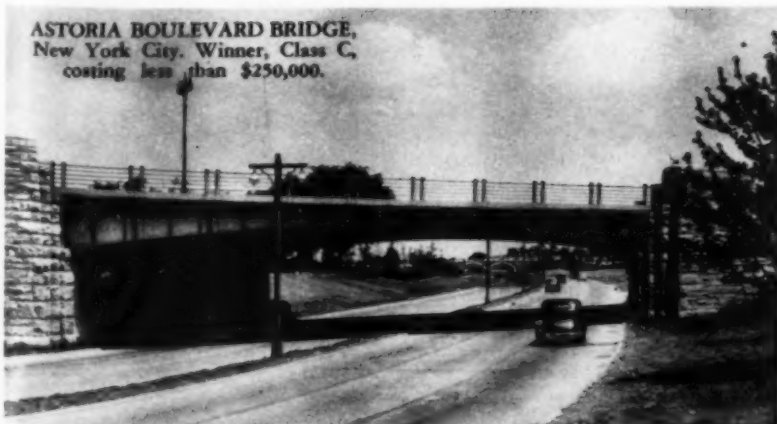
EAST RIVER CROSSING, TRIBOROUGH BRIDGE, *New York City.* Total cost, \$8,500,000. Engineers: The Triborough Bridge Authority, O. H. Am-



TRIBOROUGH BRIDGE, East River crossing, New York City. Winner, Class A, costing \$1,000,000 or more.



LAKE OF OZARKS BRIDGE in Missouri. Winner, Class B, costing from \$250,000 to \$1,000,000.



ASTORIA BOULEVARD BRIDGE, New York City. Winner, Class C, costing less than \$250,000.

sublet erection to Wisconsin Bridge & Iron Co.; Owner, Camden County, Missouri; Span lengths, three central spans each 464 ft., two side spans each 377 ft.

ASTORIA BOULEVARD BRIDGE, *over Grand Central Parkway Extension, Queens County, New York City.* Total cost, \$114,000. Engineers: Long Island State Park Commission and Triborough Bridge Authority; fabricators, American Bridge Co.; Span length, on skew, 92 ft., square 74 ft. 8 in.

This is the ninth annual award made by the American Institute of Steel Construction for the most beautiful bridges built of steel. The award was instituted to recognize aesthetic merit in the design of steel bridges.

mann, chief engineer; Allston Dana, engineer of design; Leon S. Moisseiff, consulting engineer; Aymar Embury II, architect; fabricators, American Bridge Co. and American Locomotive Co.; Span length, 1,380 ft.; width 113 ft.

HURRICANE DECK BRIDGE, *Lake of the Ozarks, Missouri.* Total cost, \$656,204.89. Engineers: Sverdrup & Parcel; fabricators, Stupp Bros. Bridge & Iron Co. fabricated the structural steel and



Wide World Photo

BRIDGE AWARD

by American Institute of Steel Construction for most beautiful structure in Class A (costing \$1,000,000 or more) built during 1936, goes to East River crossing of Triborough bridge, New York City, illustrated elsewhere in this issue. O. H. AMMANN, (left) chief engineer of Triborough Bridge Authority, receives stainless steel plaque from ROBERT T. BROOKS, (center) vice-president of American Institute of Steel Construction, as AYMAR EMBURY II, (right) architect for bridge, looks on.

This Month's

"NEWS

REEL"



SIXTH AVE. SUBWAY

construction in New York City, characterized as one of "toughest" subway jobs ever undertaken in Manhattan, due to presence of underground structures and elevated railroad, is in progress in six sections, extending from 9th to 53rd St., and covered by contracts aggregating \$29,000,000. View, above, shows one of Park Contracting Corp.'s mobile Lorain "40" truck-crane, working in cramped quarters, hoisting buckets of excavated material from point near underpinned elevated column on \$7-234,606 section of project.



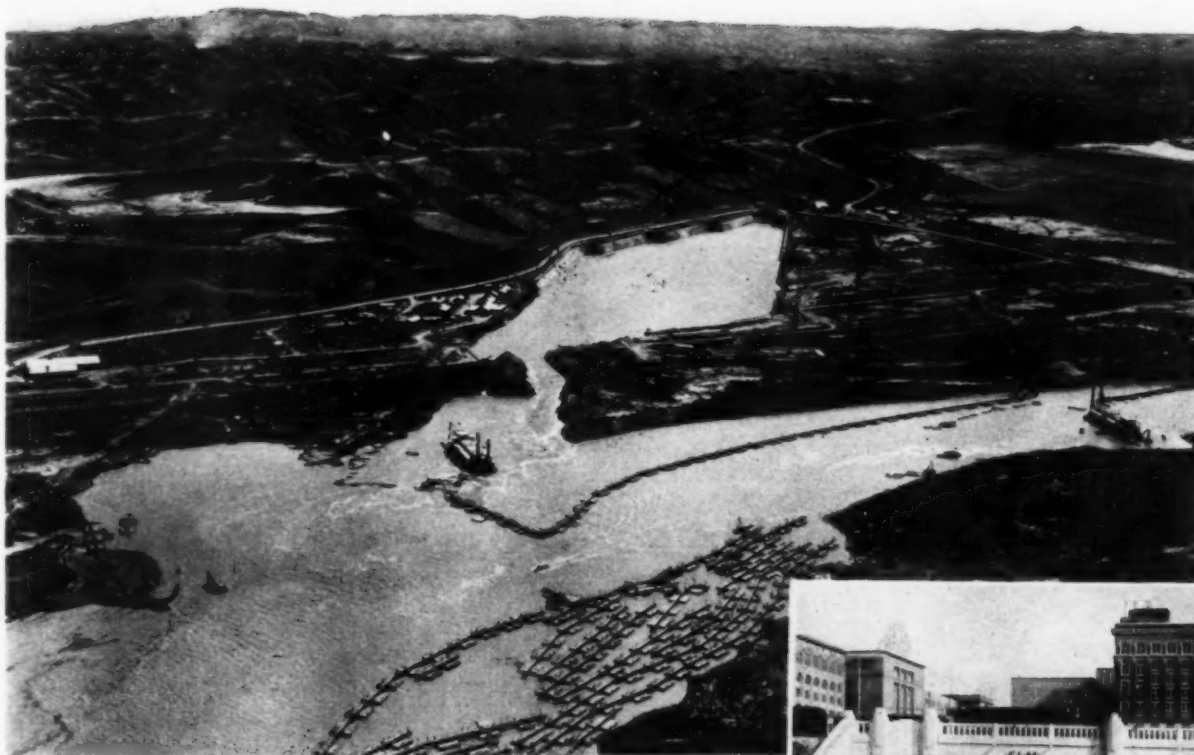
BIG MONOLITHIC PIPE

Cast-in-place section of Copper Basin reinforced concrete siphon, between Copper Basin tunnels Nos. 1 and 2 on Colorado River Aqueduct in California, is built with aid of cableway. Contractor for project is Winston Bros. & William C. Crowell, operating under supervision of Metropolitan Water District of Southern California.

MASS HOUSING

project (right) takes form in South Boston, Mass., as Matthew Cummings Co., contractor, completes superstructures for 1,016 living units in 32 buildings costing \$6,636,000, constituting Old Harbor Village project for which J. D. Leland, of Boston, is chief architect and Frank R. Creedon, project director for Housing Division of PWA. Buildings are grouped on 31-acre site.





RIVER DIVERSION

(left) is successfully completed by U. S. Army Engineers at Fort Peck dam on Missouri River in Montana, as described elsewhere in this issue. View shows outlet portals discharging flow of river 6 hr. after water was turned into four diversion tunnels. Note cut for outlet channel being enlarged by draglines, with dredges "Galatin," in center, and "Missouri" at extreme right. In foreground is "fleet" of pontoons carrying dredge pipe.

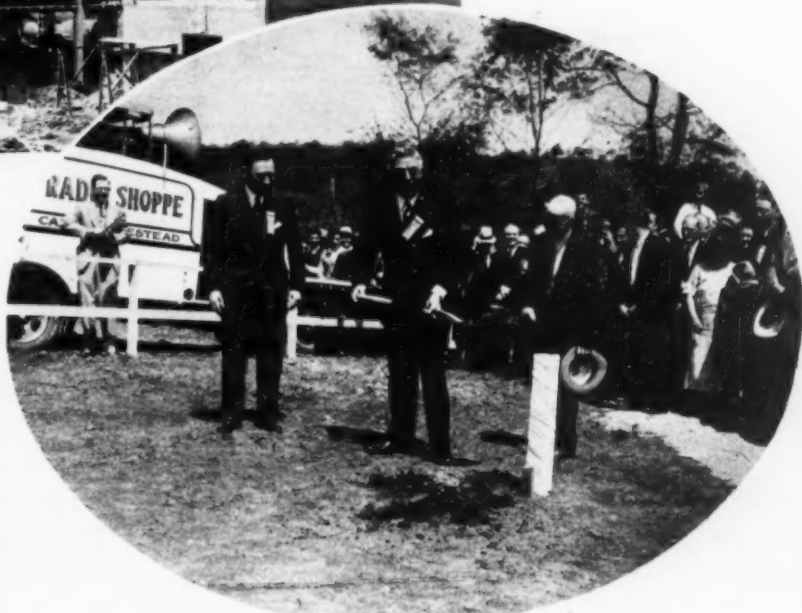
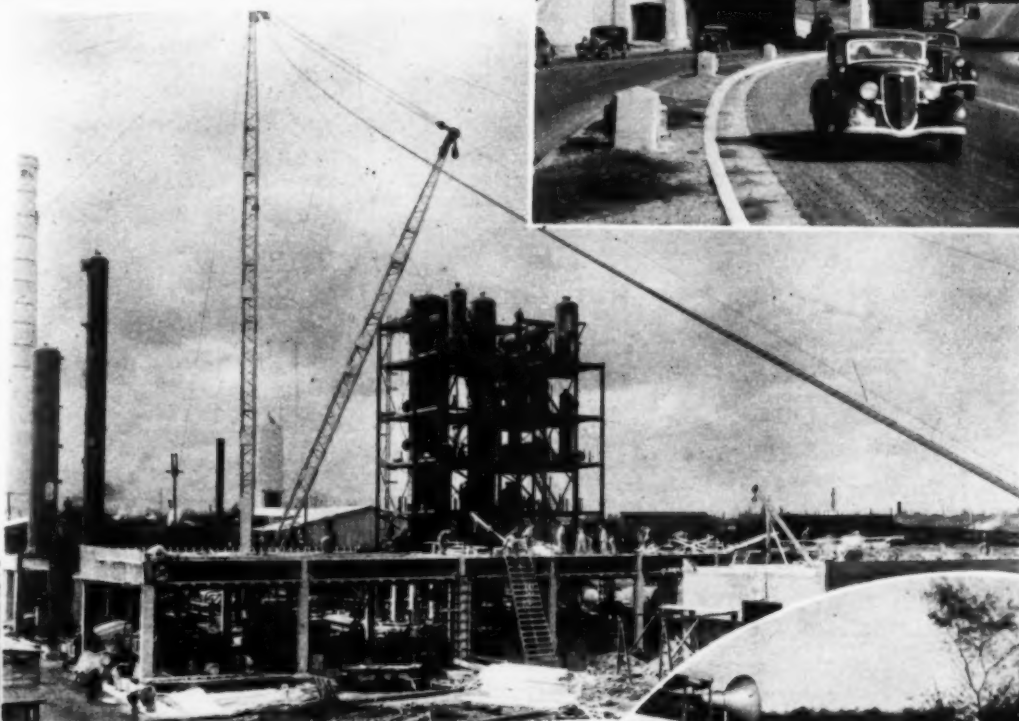


TRIPLE UNDERPASS

built by Texas State Highway Department in Dallas, Tex., sorts and separates traffic destined for three streets on far side of structure. As traffic approaches this side of underpass, drivers select and enter proper roadways in accordance with plainly visible overhead street signs and signal lights. Once past lights, safety islands prevent traffic from cutting out of separate roadways.

INDUSTRIAL CONSTRUCTION

(right) takes spurt as Atlantic Refining Co. builds at its Point Breeze refinery, Philadelphia, Pa., a big thermal polymerization plant, largest of its type in the world, with a daily capacity of 62,500 gal. of gasoline.

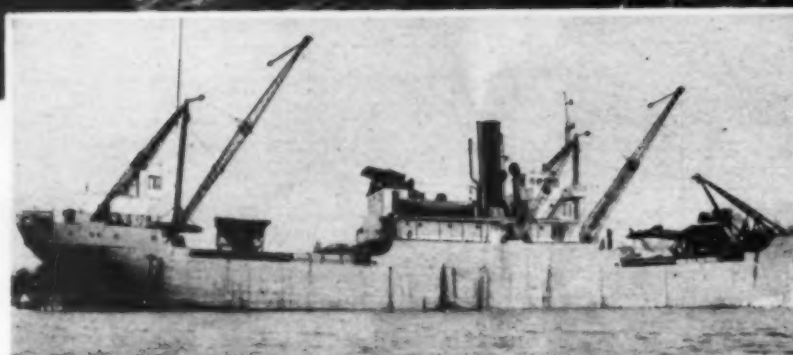


GROUND BREAKING

for Carnegie-Illinois Steel Corp.'s Irvin Works, comprising large group of strip, sheet and tin plate mills at Camden Hill, near Pittsburgh, Pa., is undertaken May 22 with stainless steel spade by William A. Irvin, president, U. S. Steel Corp., as Benjamin F. Fairless, president, Carnegie-Illinois Steel Corp., looks on. Project includes moving 3,500,000 cu.yd. of earth and placing 150,000 cu.yd. of concrete for foundations and erecting 27,000 tons of steel in mill buildings covering 52-acre site.

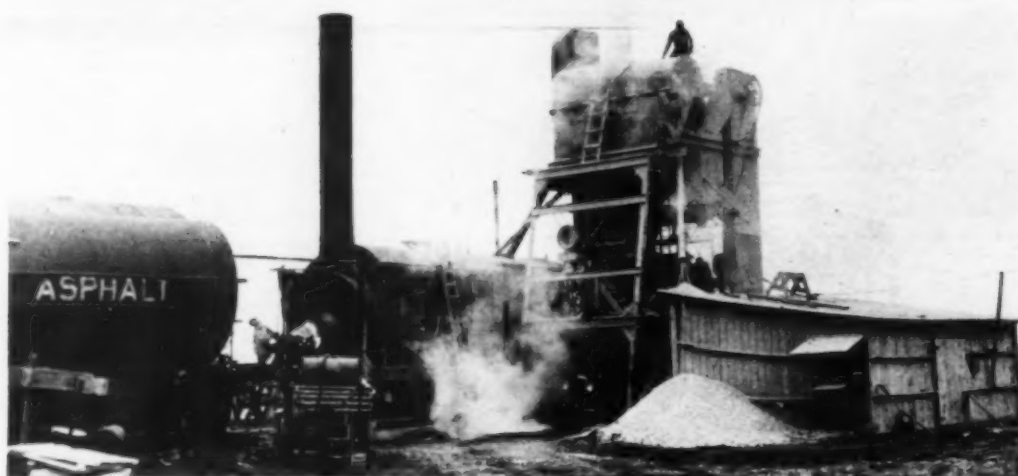


LAKEFRONT SITE (left) for asphalt plant permits water delivery of crushed stone. Asphalt is shipped in railroad tank cars.



SELF-UNLOADING CARGO CARRIER (left) delivers crushed stone to stockpiles by boom conveyor to be seen extending from far side of ship near bow. Boat carries two revolving clamshell derricks and two movable hoppers feeding belt conveyor on deck.

Automatic Heat Control Increases Asphalt Plant Production



ASPHALT PLANT turns out binder and top batches at rate of 500 to 600 boxes per 14-hr. day. Trucks drive straight through under mixer.

ALTHOUGH HEAT CONTROL apparatus was not required by Michigan's 1936 State Highway Department specifications, five bituminous paving contractors in that state last year equipped their asphalt plants with temperature controllers. One plant thus equipped was used by the Cooke Asphalt Paving Co., of Detroit, in building 13.8 mi. of bituminous concrete surface on existing stabilized gravel base on state route 55 east of Manistee. The automatic temperature controller of this typical plant was actuated by a thermo-couple in the boot of the hot sand chute, and the controller operated a pressure valve on one of the burners in the dryer, turning the burner off and on as required to hold the temperature of the aggregate in the hot sand chute within a range of plus or minus 10 deg.

Automatic heat control increased plant production 20 to 25 per cent by eliminating shutdowns by plant inspectors as a result of overheating or underheating of asphalt mixtures. Not a single box of asphalt mixture was lost on this job because the box was too hot or too cold. A plant shutdown resulting from overheating or underheating ordinarily ties up production for 10 to 20 min. When, for some other reason, the plant was shut down for 15 to 20 min. during the day, the automatic temperature controller enabled it to resume production without delay. The temperature controller also furnished definite assurance that the first load would go out hot in the morning.

Other advantages resulted from the use of automatic temperature control. The controller made it possible to de-

liver a uniform volume of aggregate to the screens and bins, assuring an adequate supply of all materials in the proper proportions throughout the day. The steady flow of aggregates through the screens made it easier to figure the percentage of carryover, as there was little variation in this percentage. For example, samples of 1/2-in. stone showed practically uniform percentages of sand carryover. In construction of the pavement, uniform temperature of the truck loads of asphaltic concrete delivered to the paving crew assured easy laying and a smooth riding surface.

Temperature Control—Temperature of the aggregate in the hot sand chute (at the discharge end of the dryer) was controlled by an instrument set up in a cabinet near the manual control levers of the mechanical feeder which fed the cold sand elevator. The instru-

ment contained a visible horizontal scale and two indicator arrows, as shown by an accompanying photograph. One of the arrows, black in color, could be set at the desired temperature. This arrow remained fixed in position. The second arrow, red in color, moved along the scale to indicate the actual temperature of the aggregate in the hot sand chute. Movements of this arrow were controlled by a thermo-couple in the hot sand chute.

In the combustion chamber of the dryer were mounted three burners, a 50-hp. pilot burner and two 100-hp. burners. One of the 100-hp. burners operated continuously, but the second of these burners operated intermittently in response to electrical control from the automatic temperature controller. The burner was equipped with a 125-lb. pressure valve electrically controlled

by the temperature controller. A battery of three burners, with one automatically controlled, gave the flexible heating capacity required to maintain uniform production with aggregates of varying moisture content and cut down the starting time in the morning to less than 30 min., as compared with the ordinary starting delay of more than 1 hr.

When the actual temperature in the hot sand chute dropped as much as 10 deg. below desired temperature, the automatic controller opened the pressure valve of the third burner. As the temperature increased to 10 deg. above

desired temperature, the controller closed the valve, shutting off the burner. In this way the apparatus held the actual temperature within a range of plus or minus 10 deg.

A battery of three signal lights, mounted above the cabinet, operated in conjunction with the instrument. When the temperature in the hot sand chute was within 10 deg. of desired temperature, a white signal light was lighted. If the temperature went below or above this limit, the burner was shut on or off, and a blue or red light appeared.

When the dryer stopped turning, the

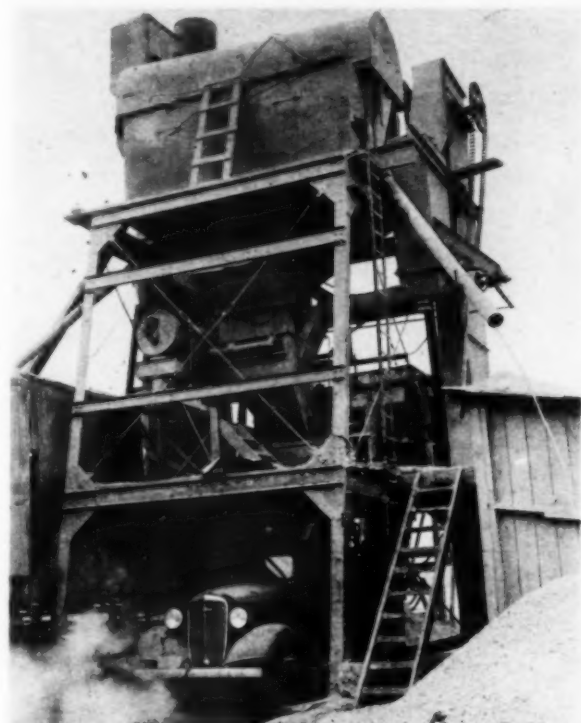
fuel pump shut off automatically, cutting off the burners.

As required by specifications, temperatures in the hot sand chute were recorded by a recording pyrometer supplied by the contractor and set up in the office of the plant inspector. The record was made on 24-hr. circular charts driven by a clock-wound motor. A clock-wound motor was preferred to an electric motor by the contractor because the pyrometer often had to be used in rural localities where 110-volt electric power was not available.

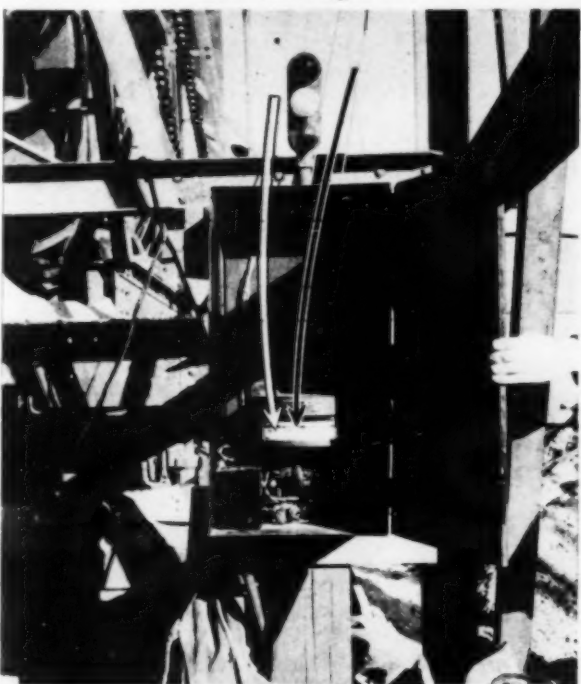
Progress—Labor on the project was limited to 8 hr. per day and 40 hr.

per week. The contractor worked two 7-hr. shifts per day, the first shift from 5 a.m. to 12 noon, and the second from 12 noon to 7 p.m. The required mixing periods were: for binder, 10 sec. dry and 35 sec. wet—total, 45 sec.; for top, 20 sec. dry and 60 sec. wet—total, 80 sec. The plant and the paving crew were able to maintain average production of 45 tons per hour on binder and 37 tons per hour on top.

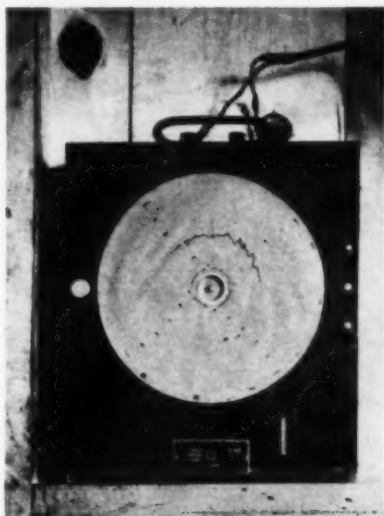
On an unusually good day, Aug. 31, the contractor placed 495 tons of binder and 115 tons of top, a total of 610 tons, in 14½ hr. Running binder



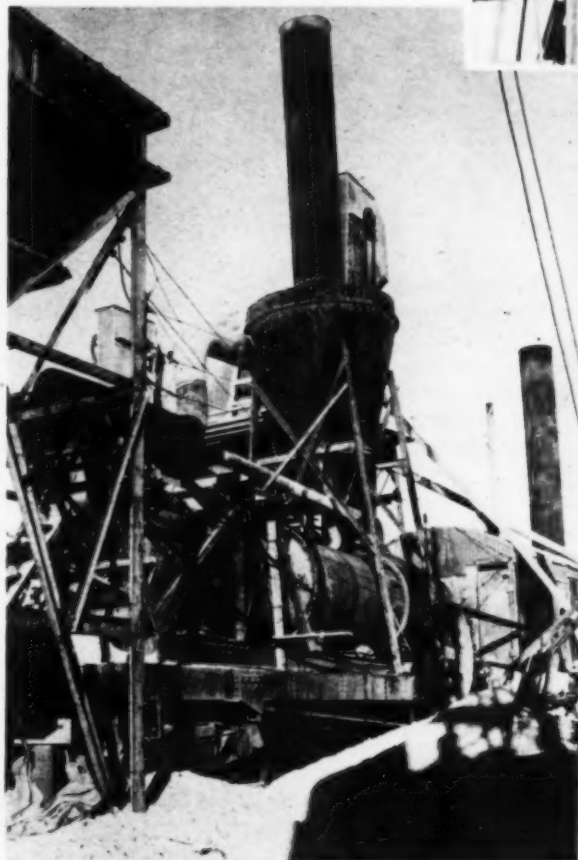
ROTARY SCREENS housed at top of plant deliver accurately sized aggregates to bins above weigh hoppers. Filler dust for top mixture is raised by elevator from shed at right.



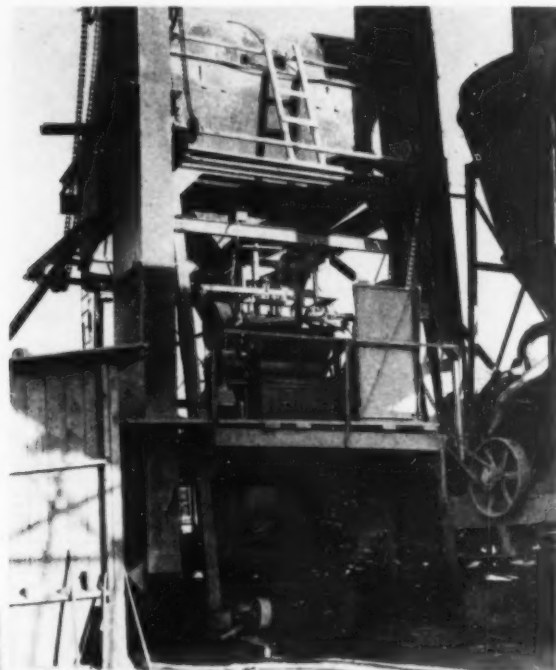
AUTOMATIC TEMPERATURE CONTROLLER maintains uniform temperature in hot sand chute. Black arrow is set at desired temperature by inspector. Red arrow indicates actual temperature in hot sand chute. Control device, by turning on or off electrically controlled burner in dryer, holds temperature within 10 deg. of desired temperature.



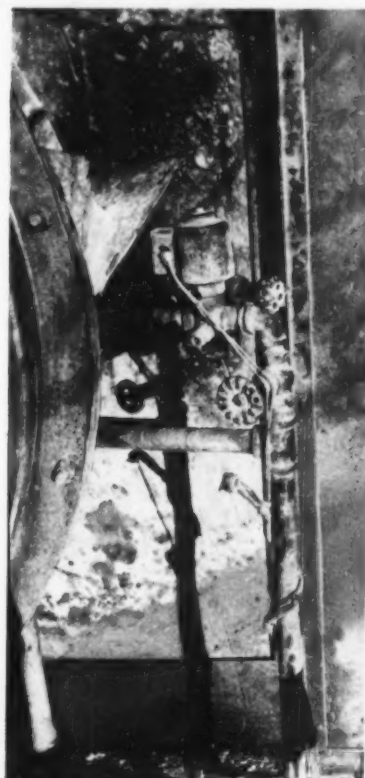
RECORDING PYROMETER in plant inspector's office makes 24-hr. record on circular chart.



DRYER mounted on railroad car is equipped with three burners for flexible control of heat. One of three burners is turned on and off by automatic temperature controller in cabinet under steel bins at left.



CHAIN DRIVES operate rotary screens, elevators, and pug mill mixer.

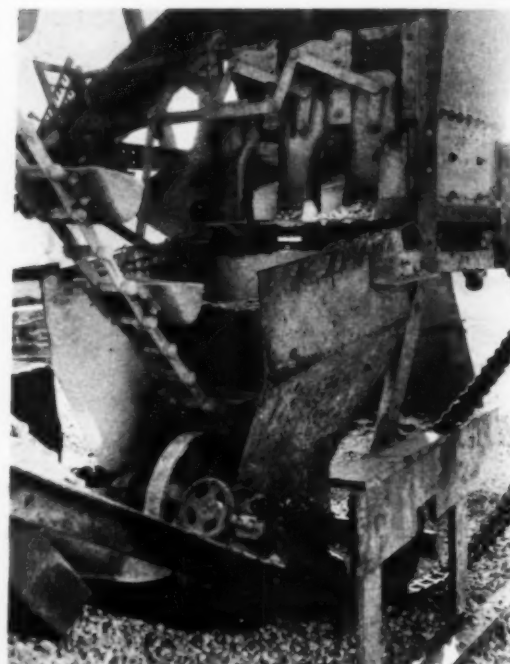


PRESSURE VALVE electrically controlled by automatic temperature controller operates 100-hp. burner in dryer. Controller opens or closes this valve as required to hold temperature in hot sand chute within 10 deg. of desired ideal temperature.

Typical Batch Weights of Bituminous Concrete Mixtures

Material	Weight
TOP MIXTURE	
Asphalt Cement	123 lb.
Filler	80
Sand	677
Stone (½-in.)	1,120
	2,000 lb.
BINDER MIXTURE	
Asphalt Cement	90 lb.
Sand	480
½-in. to No. 10	280
1½-in. to ½-in.	1,150
	2,000 lb.

MECHANICAL TIME-LOCK (right) (with side plate of housing removed) is easily adjusted by inspector to control dry and wet mix periods for binder and top mixtures. Counter at upper left registers mixed batches.



RECIPROCATING SLIDE GATES of mechanical feeder discharge aggregates to cold sand elevator at uniform rate. Manual levers at left are used to set gate openings.



FIVE BATCHES PER LOAD are delivered by dump trucks to spreader boxes on road. Finishing machine and roller follow closely behind two spreader boxes.

and top, the organization placed on 5 consecutive 14-hr. days, Sept. 1 to 5, inclusive, 575, 525, 564, 545 and 520 tons—a total of 2,729 tons in these five days.

Laying 2½-1½-2½-in. binder and 1-in. uniform thickness top 20-ft. wide, the contractor averaged 2 mi. a week in good weather. The minimum haul was ½ mi. and the maximum haul was 13½ mi. Each truck hauled five 2,000-lb. boxes of asphaltic concrete. In adjusting the size of the truck fleet to fit the hauling distance, the contractor figured about one truck for each mile of one-way haul.

At the plant, the daily changeover from top to binder usually was made in 5 min., and the changeover never required more than 10 min., saving at least 20 min. over the time ordinarily required for this operation. The plant superintendent speeded the change by having the binder stone in the dryer while the last boxes of top were being mixed, with the bins empty.

Subgrading on the contract started Aug. 6, and the first pavement was laid Aug. 17, 1936. The contract specified a completion date of Jan. 1, 1937, but all work was completed and accepted by the State Highway Department and the U. S. Bureau of Public Roads on Nov. 10, 1936.

Asphalt Plant—Set up on the shore of Manistee Lake (connected by a channel with Lake Michigan) to permit delivery by self-unloading cargo carrier of crushed limestone aggregate from Sturgeon Bay, Wis., the asphalt plant included a steam boiler, dryer and asphalt storage tanks mounted per-

PAIR OF SPREADER BOXES (right), each 9 ft. wide, covers most of 20-ft. width between steel road forms.



manently on railroad cars, with aggregate feeding hoppers and the mixing plant set up on steel towers at the intake and discharge ends of the dryer. A gasoline crawler crane operating a 1-yd. clamshell bucket on a 50-ft. boom filled the hoppers, holding almost 50 yd., which fed the cold sand elevator. This machine also blended the two grades of local sand, one fine and one coarse, delivered by truck from pits 3 mi. distant. The sand was blended, three buckets of coarse and two buckets of fine, in a blending pile adjacent to the hoppers before being transferred into the hoppers themselves. A mechanical feeder equipped with reciprocating-slide gates fed the aggregates from the hoppers into the boot of the cold sand elevator. The gate openings were controlled by manual levers.

A dryer 24 ft. long by 4 ft. 8 in. in diameter was fitted with a combustion chamber which had been lengthened from 24 in. to 48 in. Air was circulated through the dryer by a belt-driven 38-in. fan, turning about 500 r.p.m., with a 22-in. inlet and a 16-in.

outlet. The fan delivered to a dust collector which reclaimed the dust and fed a continual stream to the hot sand elevator.

Above the bins of the mixing plant was a set of rotary screens, all equipped with square openings, in the following sizes: (1) a 5-ft.x30-in. rejection screen with 3/16-in. openings, (2) a 5-ft.x40-in. sand screen with 1/8-in. openings, (3) a 4-ft.x30-in. screen with 3/4-in. openings, (4) a 4-ft.x40-in. screen with 1/2-in. openings. When screening aggregates for top mixture, the plant rejected material passing the 3/16-in. screen and retained on the 1/8-in. screen and, also, rejected stone retained on the 1/2-in. screen. For binder mixture, nothing was rejected. Material rejected from the top mixture was put back into the aggregate feeding hoppers for the binder mixture.

A 100-hp. horizontal fire-tube boiler heated the asphalt and operated two asphalt pumps, as well as one fuel oil pump for the burners. This boiler also supplied steam at a pressure of 100 lb. to 5-in. jackets on the 3-in. asphalt lines. The steam jacket raised the

temperature of the asphalt 10 deg. between the cars and the mixer, increasing it from 265 deg. at the cars to 275 deg. at the plant.

A total of seven three-way valves was used in connection with the two asphalt pumps to permit flexibility in delivery of the material. One pump, equipped with three three-way valves, could pump in any direction among four storage tanks (on railroad cars) and four asphalt cars as necessary in transfer and blending. The second pump delivered to the mixer from either of two storage tanks.

A cumulative dial scale registered the weights of dry materials for the asphaltic concrete mixtures. Asphalt was weighed in a steam jacketed bucket, the weight being indicated on a second dial scale. Mixing periods were automatically controlled by a timing device operated by chain drive from the drive shaft of the pug-mill mixer.

Mechanical Timelock—Mixing operations were controlled completely by a mechanical mixer timing device which could be set by the inspector to

give the required dry and wet mixing periods. One man at the plant weighed out the dry material. When the asphalt operator saw that the dial scale registered the total cumulative weight of dry materials, he pulled a lever which released the aggregates into the pug mill. The timing device could not be started until this lever had been pulled. After pulling it, the operator pulled a chain to start the timer.

At the end of the dry-mix period, a lever automatically disengaged itself to permit the operator to pull the asphalt lever discharging the asphalt bucket into the pug mill. Pulling this lever started the wet-mix period.

At the end of the wet-mix period, a dog on the side of the mixer released, allowing the operator to dump the mix. The gate on the aggregate weigh box remained locked until the mixer was discharged, a bar locked by the timer preventing discharge of the aggregate until the mixer had been emptied.

Simplicity of the timelocking device made it possible for a mechanic to repair it easily in case of need. Inside the box which covered the timer was a counting machine which automatically registered each mixed batch.

Ingredients—Asphalt cement in the binder mixture was either straight California or straight Venezuela. For the

340 deg F as ideal for laying top mixture.

Dust Determination—To determine accurately the amount of filler which had to be added to top mixtures, the plant inspectors made sand analyses to find the percentage passing a 200-mesh sieve, which was classed as dust. Specifications permitted not more than 5 per cent to pass. On this job, 4 to 5 per cent of the sand passed the 200-mesh sieve. Some dust also was present in the stone ($\frac{1}{2}$ per cent or less). The total dust desired in the mixture was 6 to $7\frac{1}{2}$ per cent. Filler contained about 90 per cent dust. The dust in the filler plus the dust in the sand plus the dust in the stone gave 120 to 135 lb. per 2,000-lb. batch.

Laboratory Tests—Three laboratory tests were made to check the make-up and quality of the asphaltic concrete mixtures. The first test was made at the plant laboratory with a composite sample taken from several trucks loaded at the mixer. A part of this composite sample was sent to the state highway department laboratory at Ann Arbor for a check. After the mixture had been laid in the pavement and had cooled, two samples of the pavement (deposited from the same truck loads which had been sampled at the plant) were removed and shipped to

the department laboratory for a recovery test. These pavement samples weighed 15 to 20 lb. each when taken from the binder course and 10 to 15 lb. each when taken from the top course. One sample was taken from the right side of the road and the other from the left side. Accompanying tables give the results of typical tests for binder and for top. As a whole, the tests showed accurate plant control and satisfactory separation of sizes by the screens. Bitumen extracted from the samples in the recovery test showed practically no loss of ductility or penetration.

Pavement Construction—Paving work started at the west end of the project (nearest the asphalt plant) and ran east for $1\frac{1}{4}$ mi. From this point on the contractor worked east in steps of $3\frac{1}{2}$ mi. each, paving back toward the plant in each case. The pavement thus was completed in four jumps, and the trucks had the benefit of a finished roadway for hauling.

Pavement was laid on a two-course gravel road originally built in 1931

and surface treated in recent years with stabilized clay-bound gravel sprinkled with sodium chloride brine solution. For the new road, the engineers ran a line following the original road survey as closely as possible, taking cross-sections every 50 ft. at the center line and at right and left offset points 5 and 10 ft. from the center line. The survey party set grade stakes every 50 ft., conforming as closely as possible with the grade of the old road in order to avoid disturbing the stabilized surface any more than necessary. Width of the existing gravel base was 21 ft.

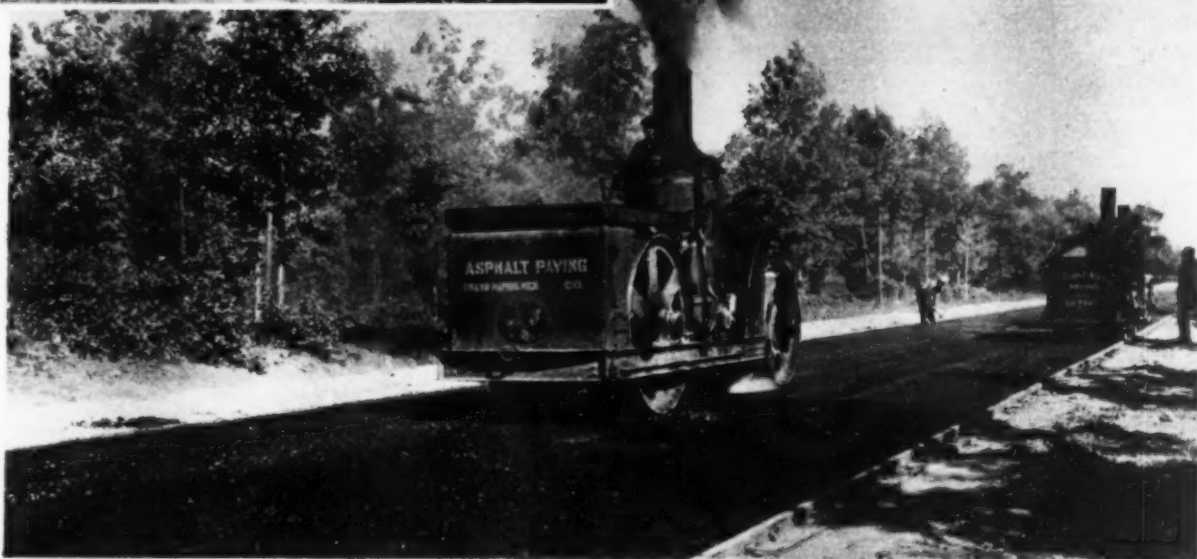
On this base, after fine grading and priming, the contractor laid a $2\frac{1}{2}$ - $1\frac{1}{2}$ - $2\frac{1}{2}$ -in. binder course with the $2\frac{1}{2}$ -in. thickened edges reducing to $1\frac{1}{2}$ in. in a 3-ft. straight taper. The engineers in charge desired to average 165 lb. of asphaltic concrete per square yard of binder course. For the top course, which had a uniform 1-in. thickness, the builders aimed to place 104 lb. of material per square yard.

Fine grading for the new pavement

FLOATING RUNNERS (right), which are free to move up and down on front wheel axles of spreader boxes, help to iron out any irregularities in base.



FINISHING MACHINE carries two tanks of compressed gas for heating screed on cool mornings, as well as 1,500-watt generator for night lighting.



BINDER COURSE is compacted behind finishing machine by longitudinal rolling with 10-ton and 8-ton rollers.

top mixture the engineers required a 50-50 blend by volume of Trinidad and either California or Venezuela asphalt. Filler for the top mixture was limestone dust from Waukesha, Wis. Crushed limestone came from Sturgeon Bay, Wis., and sand was produced from nearby local pits.

Temperature of Mix—Specifications required that the temperatures of both binder and top mixtures should be between 275 and 375 deg. F. at the plant and on the road. For conditions on this contract, the engineers set 300 to 320 deg. F. as ideal for laying binder mixture on the road and 300 to

was done with a power subgrader which required steel road forms as a track. A line of form grade stakes was installed by the engineers at least one day's run ahead of the fine grade crew, the form grade being adjusted where necessary to give the desired thickness of binder. Form setters placed 8-in.-high steel road forms to match the grade of a string line on these stakes. The gravel surface proved so hard that it was necessary to soften it by wetting with a sprinkler truck ahead of the self-propelled power subgrader. After the fine grading had been completed, the steel road forms were removed, and the surface was given a prime coat of cutback asphalt at the rate of 1 gal. to 3 sq. yd. The primer was applied by a pressure distributor which had its pump discharge controlled by the truck operator. A special speed indicating device assured accurate coordination of pump pressure and truck speed.

Laying Binder and Top — Two spreader boxes 9 ft. wide equipped with floating runners and diagonal rear screeds spread the material for both binder and top courses. The dump trucks hooked on to these boxes and pulled them forward while they discharged their loads. A standard finishing machine operating behind the spreader boxes struck off both the binder and top courses. As required by 1936 specifications, the finishing machine had an independent screed action which was not related to the forward speed of the finisher. For the binder course, a special plate was attached to the screed to strike off material below the top of the form. The finishing machine traveled on 3½x8-in. forms set to accurate pave-

Typical Analysis of Binder Mixture

AUGUST 31, 1936

INGREDIENTS IN SAMPLES (Samples average close to 500 grams)	At plant lab.	PER CENT BY WEIGHT At Highway Department lab., Ann Arbor, Mich.	
		Plant sample	Recovery sample
Retained on 1-in. screen	Omitted	6.9	4.9
" " ½-in. "	57.2	46.8	60.7
" " ¼-in. "	10.8	10.1	6.8
" " No. 10 "	1.2	1.5	0.9
" " No. 40 "	5.4	5.5	3.8
" " No. 80 "	12.2	14.5	10.8
" " No. 200 "	6.2	7.3	6.1
Pass No. 200	2.4	2.9	1.8
Bitumen	4.6	4.5	4.2
Retained on No. 10 (stone)	69.2	65.3	73.3
Pass No. 10 (sand)	26.2	30.2	22.5
Bitumen	4.6	4.5	4.2
	100.0	100.0	100.0

Note: In 500-gram recovery sample tested, bitumen content is low because stone content is high.

Original penetration	76	Dust in recovered asphalt	1.4 per cent
Recovery penetration	76	Temperature of mix at plant	275-280 deg. F.
Original ductility	150+	Temperature of mix at road	270 deg. F.
Recovery ductility	150+		

Typical Analysis of Top Mixture

SEPTEMBER 3, 1936

INGREDIENTS IN SAMPLES (Samples average close to 500 grams)	At plant lab.	PER CENT BY WEIGHT At Highway Department lab., Ann Arbor, Mich.	
		Plant sample	Recovery sample
Pass ¾-in., retained on ½-in. screen	1.2	0.9	2.3
" ½-in., " " ¼-in. "	50.4	50.0	49.7
" ¼-in., " " No. 10 "	5.2	4.5	5.3
Pass No. 10, retained on No. 40 screen	7.2	7.5	7.1
" No. 40, " " No. 80 "	17.1	18.2	15.4
" No. 80, " " No. 200 "	7.2	7.4	8.0
" No. 200	6.0	6.0	6.4
Bitumen	5.7	5.5	5.8

Original penetration	58	Dust in recovered asphalt	2.3 per cent
Recovery penetration	54	Temperature of mix at plant	355-360 deg. F.
Original ductility	150+	Temperature of mix at road	355 deg. F.
Recovery ductility	150+		

ment grade. An 8-in. base was specified for these forms.

After being struck off a little high by the finishing machine, the binder course was rolled longitudinally with a 10-ton steam tandem roller. For the top course, rolling called first for a combination longitudinal and cross rolling with two 8-ton steam tandem rollers, followed by diagonal rolling with the 10-ton roller. After checking with a 10-ft. wooden straight-edge, the 10-ton machine rolled out the bumps by cross rolling. As a final check, the surface was tested with an electric-buzzer surface tester set to detect irregularities of ⅛ in. in 10 ft. Bumps detected by this device were ground off with a carborundum disk driven by a gasoline motor. These spots then were painted with asphalt cutback to restore their color.

Shoulders of the pavement were built of gravel supplemented where necessary with clay from borrow pits. The contract called for the construction of compacted gravel turnouts at rural mail boxes. Michigan undertook the construction of these turnouts for the first time in 1936, following the example of Indiana.

Administration — Murray D. Van Wagoner is state highway commissioner, Harry C. Coons is deputy commissioner-chief engineer, and V. B. Steinbaugh is deputy commissioner-road engineer. Operations on the contract east of Manistee were carried out under the general direction of E. G. Schwoppe, district engineer, Cadillac, with H. J. Rathfoot, project engineer, in charge at the site. For the Cooke Asphalt Paving Co., Detroit, Mich., contractor, H. K. Thompson, superintendent, was in complete charge.

Closed-Shop Demands by C. I. O. Refused on Colorado River Aqueduct

HEREWITH is a statement of the employment policy of The Metropolitan Water District of Southern California issued by Chairman W. P. Whitsett of the Board of Directors by order of the Board. The statement was issued July 2, following the appearance before the Board of a delegation speaking for Local Union No. 270, Aqueduct, Subway, and Tunnel Workers, an affiliate of the Committee for Industrial Organization. Spokesmen of the union group requested a "closed shop" agreement with the District.

NOTICE TO EMPLOYEES

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
EMPLOYMENT POLICY OF DISTRICT

1. The Metropolitan Water District of Southern California is a political subdivision of the State of California, and by the express terms of the National Labor Relations (Wagner) Act is not subject to that act.
2. It is unlawful for the District to enter into any agreement which will limit or restrict the right of citizens qualified for the work and residing within the District to obtain employment on the Colorado River Aqueduct.
3. This Board cannot and will not restrict employment to members of any single union any more than it would exclusively reserve all the jobs for members of a certain church or of a political organization.
4. Our investigations have failed to reveal that any city or district in California has entered into any "closed shop" agreement with any union. Reported instances of such agreements are without foundation in fact.
5. The responsibility for the construction of the aqueduct is by law imposed on the Board of Directors. Full authority to direct the progress of work and to stop work on any portion at any time rests exclusively with the Board of Directors. This authority has in no way been limited or restricted by agreement with the Reconstruction Finance Corporation or any other governmental agency.
6. This Board has not and will not foster, encourage,

discourage or oppose the joining of any lawful organization by any of its employees; nor will this Board in any manner favor or discriminate against any employee or group of employees because of membership or non-membership in any organization.

7. It will continue to be the policy of this Board to treat with the representatives of any group of employees or any individual employee, through the staff of the General Manager and Chief Engineer, regarding working conditions or terms of employment.

8. Throughout the construction of the aqueduct this Board has earnestly endeavored to maintain superior living and safe working conditions for its employees. Wages have been increased from time to time as warranted by changed conditions.

9. This Board has by ordinance set up fair rules and regulations governing all District employment. This employment policy has proved to be satisfactory and will be maintained. Special written agreements will not be made with any particular group of employees.

10. The loyalty and fine cooperation of the employees, which have brought this great project so near completion, are greatly appreciated by this Board and deserve the thanks of the entire District.

JOB ODDITIES

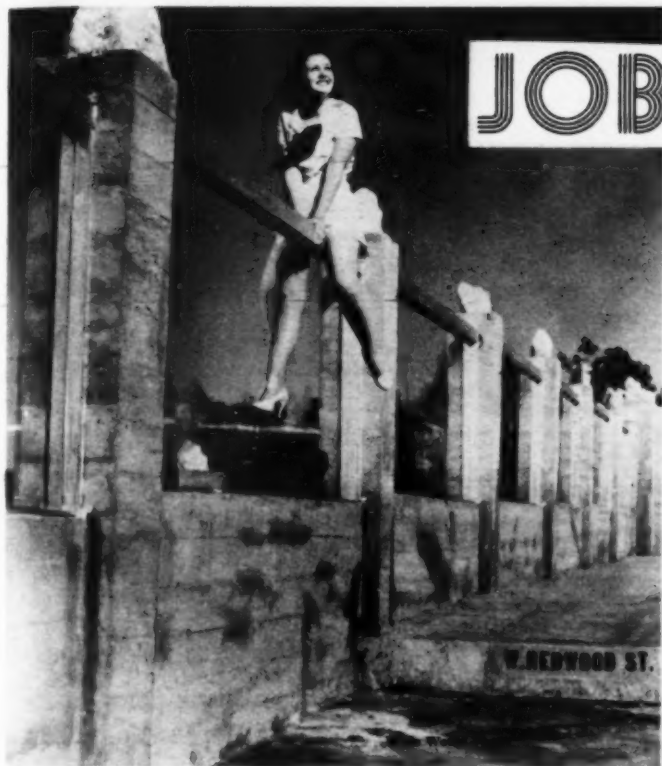


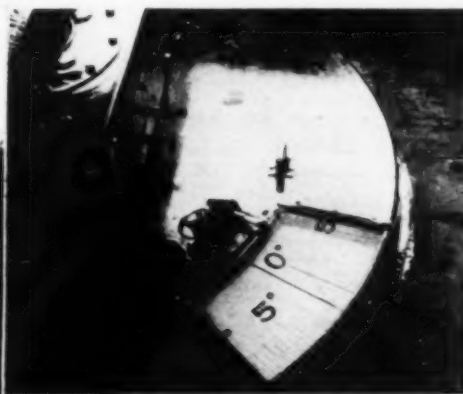
PLATE GLASS FENCE

surrounds palatial residence of Al Wuest, realtor of San Diego, Calif. When asked the reason for the plate glass type of construction Mr. Wuest's standard reply is: "That's easy to see through."



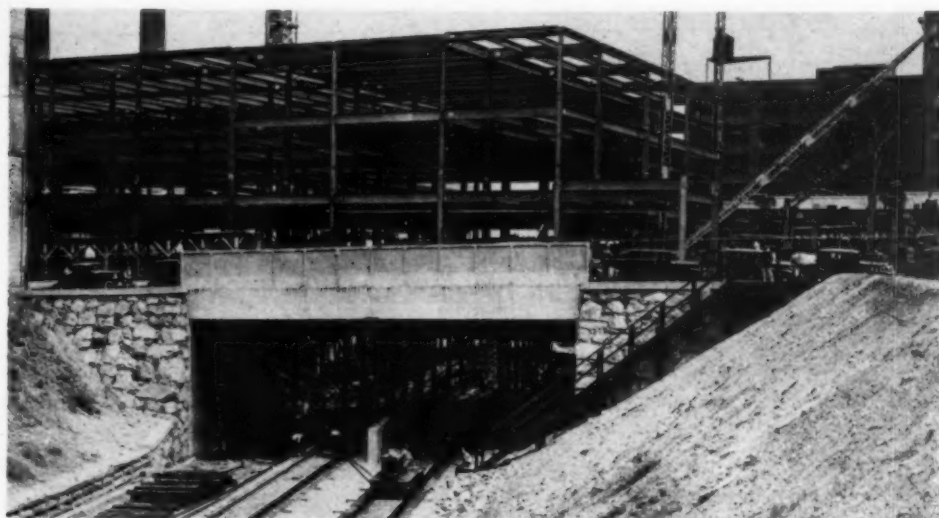
DEGREE OF CURVATURE

(left and above) on Arkansas highways is measured by this device, consisting of truck haul-



RAILROAD IN BASEMENT

simplifies handling of milk shipments at new \$2,500,000 dairy plant of Sheffield Farms Co. which spans depressed tracks of New York Central Railroad along 11th Ave., at 57th St., New York City. From tank cars on tracks milk will be pumped directly to large holding tanks for pasteurizing and bottling.



ing trailer in form of long steel truss with its rear end carried by pneumatic-tired wheel riding on pavement. Dial reading indicates angle of curve for highway inventory. When not in use trailer element is unhooked and carried on top of truck.



"He says you been sending up smoke signals asking for his daughter's hand and he accepts."

CONSTRUCTION Methods and Equipment — August, 1937



CHINAMAN'S CHANCE

to bolster up undermined toe of mass concrete retaining wall in Shanghai is made possible by modern equipment in form of Koehring No. 10 mud-jack, operating in pit protected by cofferdam of steel sheetpiling. Excessive dredging in adjoining creek caused cavity under toe of retaining wall which was filled with mud pumped under pressure. Repairs were made by Shanghai Municipal Council.

Labor Agreements That Work

In a Closed-Shop City

By VINCENT B. SMITH

Associate Editor, *Construction Methods and Equipment*

PATIENT, PERSEVERING EFFORT over a span of 15 years has built up a system of workable labor agreements in the building trades of Niagara Falls, N. Y. The system operates successfully today because contractors and labor leaders with reasonable viewpoints are willing to give needed effort and time to maintaining amicable relations. Cultivation and steady improvement of these relations receive as much attention now as during the trying period when distrust and suspicion were slowly giving way to more friendly feelings induced by fair dealing on both sides.

Although the agreements themselves represent a constructive advance in the handling of employer-employee relations, it is not so much the written contracts as the atmosphere of mutual trust and confidence in which they are interpreted and applied that is basically responsible for stable conditions in the building trades. Many grievances and complaints which, in other days, would have caused a labor leader to pull his men off a job are today adjusted quietly and promptly by a conference between the contractor and the union's business agent. Matters of major importance, such as wages and hours, are arbitrated by committees made up of builders and union representatives. The success of this method is due to the appointment of reasonable men by both sides and to their willingness to accept a fair settlement.

As the result of a long period of fair dealing by both contractors and unions, an attitude of complete respect for labor contracts has been created. Minor violations are quickly adjusted or, if necessary, arbitrated, without being allowed to damage the fundamental principle, expressed in some agreements and tacitly accepted in others, that there shall be no stoppage of the work for any cause whatever. Except for a minor walkout by a single craft, lasting only 1 day, Niagara Falls has had no strikes for 12 years in the key trades which make agreements with the Builders' Association.

Building Trades Unions

Eleven unions now compose the Building Trades Council of the city. These unions have a membership of 1,300 to 1,400 skilled mechanics, although at one time the number was 2,300. A union for common labor was admitted to the council 2 years ago,

making the eleventh unit of the group. The contractors now are negotiating an agreement with the laborers' union.

Five of the skilled crafts (carpenters, bricklayers, plasterers, lathers and hoisting engineers) make their agreements with the Builders' Association. The remaining five (painters, plumbers, steamfitters, electricians and sheet-metal workers) make separate agreements with individual employer groups. This distinction results partly from the fact that the five last-named unions engage in work which often has no connection with new construction, and their employers therefore are not members of the Builders' Association. These unions have had difficulties with employers in recent years, leading to individual strikes of short duration; but in general the influence of amicable relations between contractors and labor unions has pervaded all trades and prevented any disturbance which could tie up a job or cause a workman to lose a day's pay.

Labor Agreements

Contractors and union leaders agree that the administration of labor contracts, rather than the drafting of them, determines their success or failure. With some variation, the contracts state in understandable language the regulations governing wages, hours, conditions of employment, arbitration and duration of agreement. Ordinarily the agreements run for 1 year and renew automatically if neither party applies for a change at the time specified. In nearly all cases notice of a desired change must be given to the other party at least 5 months in advance of expiration of the agreement. Committees representing the two parties then meet to arbitrate the question of changes in the contract. A decision must be reached at least 3 months before the renewal date. The effective dates for most agreements are April 1 and May 1. An effort now is being made by the contractors to renew all agreements on April 1, at the start of the active construction season. These agreements would have to be signed by Jan. 1, to become effective 3 months later.

In the belief that an agreement for a longer period would promote stability in the building trades, the contractors and the carpenters signed a 3-yr. contract which became effective April 1, 1936, and runs to April 1, 1939. The carpenters' union, with 400 mem-

bers, is the largest unit in the Building Trades Council. Because of the long duration of the contract, it was necessary that some provision be made for changing wage rates within the 3-yr. period. The drafters worked out a method of wage adjustments in accordance with changes in the cost of living. At the same time, provision was made for sufficient advance notice of wage increases to protect the contractors against sudden drastic rises. This interesting article of the carpenters' agreement reads as follows:

"Upon the request of either party communicated in writing at any time subsequent to July 1, 1936 (3 months after the effective date—Ed.), the parties hereto agree to consider changes in the wage rate fixed by this agreement, such change to be conditional upon appropriate changes in the cost of living as fixed by the U. S. Department of Labor index numbers. Any

viction that mechanics earn a larger income in time of business depression by maintaining wages at a high level and that little additional construction would be stimulated in such a period even by drastic wage reductions. It will be noted that the article on wage modification gives the contractors minimum advance warning of 3 months regarding prospective wage increases.

Arbitration

Another article of the carpenters' agreement which is typical of other agreements is that referring to arbitration. The only particular in which the agreements differ is in naming their courts of last resort. In the carpenters' contract, the National Labor Relations Board is chosen. Other agreements specify different choices and often provide other means of selecting umpires. The article on arbitration follows:

"The parties hereto agree to the



CITY OF NIAGARA FALLS, with abundance of cheap electric power, attracts scores of chemical and manufacturing industries which provide substantial backlog for annual construction volume now running between \$2,500,000 and \$3,000,000, as compared with \$7,000,000 average for 1924-30 period.

wage rate changes to be applicable three months after completion of negotiation and the wage so fixed shall hold for not less than six months."

Index numbers used under the agreement are those for Buffalo, about 15 mi. distant, the nearest city for which the U. S. Department of Labor furnishes a cost of living index. Union leaders say that the adopted method of adjusting wages is acceptable to the members while living costs and wage rates are rising but that the method is almost bound to meet with serious opposition when prices go into reverse. Building trades unions retain the con-

arbitration of all disputes and provide that there shall be no stoppage of work for any cause whatsoever. Three members of each party hereto designated in writing shall constitute the Arbitration Board. Such designations may be changed by either party from time to time. In event of their failure to agree this board shall appoint an umpire or refer the dispute to the National Labor Board for settlement. The decisions of the arbitration board, the umpire, or the National Labor Board shall be final and binding on both parties.

"The duties of the arbitration board shall be to hear complaints by either party to this agreement, in-

interpret the agreement, and to settle all disputes between the parties, adjusting all difficulties and fixing the penalties, or to refer the disputes as provided above."

As the arbitration boards established by all agreements between the key unions and the Builders' Association actually settle every dispute, the provision of an umpire or court of final appeal is purely precautionary. An umpire was appointed to settle a dispute 15 years ago and another was called in 12 years ago. Since those two disputes, no umpires have been needed.

A standing committee of three members is appointed by the Builders' Association to serve as its representatives on the arbitration board. The committee has full authority to act for the association. Separate committees are appointed to meet with the different unions, although one member may serve on more than one committee. The unions ordinarily appoint new

business agent of the Union shall be recognized as the representative of the carpenters and shall have the privilege of visiting jobs at all times. In case of violation of this agreement, there shall be no stoppage of the work, but the business agent shall attempt to negotiate a settlement with the employers affected. In event of his failure to negotiate a satisfactory settlement within twenty-four hours, the dispute shall be referred to arbitration as provided in Article V hereof."

As an example of arbitration, the hoisting engineers' union recently complained against a contractor who was using a common laborer to operate a material hoist of automatic type. The contractor wished to have the question settled by the arbitration board, which quickly decided in favor of the hoisting engineers. Both parties accepted the decision as final, and they would have accepted any other decision just as completely.

Human Elements

From the foregoing description of labor conditions in the building trades in Niagara Falls it is not to be assumed that the friendly relations now existing are the product of supermen or angels. The primary causes of labor trouble—the blasting caps, as it were—are just as prevalent in this city as in any other where men try to make a living under the employer-employee relationship. Years of steady, level-headed dealing on both sides have produced an environment which prevents the common causes of trouble—the blasting caps—from exploding. Minor violations of the agreements are fairly frequent on both sides. No written regulation will stop every contractor and every mechanic from taking advantage of a situation which offers greater profit outside the agreement. And no agreement can prevent either side from pressing its opportunity when it happens to be in control. The encouraging feature of the Niagara Falls system is that the party in the wrong always is willing to listen to the party in the right and to make any concessions required by a fair adjustment.

As a small city of 82,000 people, Niagara Falls possesses certain advantages which probably aided progress toward rational contractor-labor relations. Specialization of the trades is carried to no such extent as is possible in a large city, and jurisdictional disputes are consequently less frequent and more readily settled. As already mentioned, the Building Trades Council comprises only eleven unions. The number of agreements thus is kept to a correspondingly reasonable figure. This fact, together with the size of the city, permits more frequent and more direct contact between the heads of contracting firms and union leaders.

An additional asset is the fact that the building trades in the city are 100 per cent closed shop. The contractors prefer this condition for several reasons, two of which are: (1) The solidarity of the workers permits the contractors to make agreements upon which they can depend, and (2) the complete unionization of labor puts a check on irresponsible newcomers in the contracting business and prevents wage cutting by cheap operators. In general, the local unions admit willingly competent non-union workmen who have been hired to do skilled work, and these men are permitted to pay their initiation fees in installments. The unionization of construction workers is endorsed by the contractors as a necessary protection for the workman himself. Having no continuity of employment under one employer but shifting from job to job as his services are needed, the construction worker must organize with his fellow craftsmen to assure uniform wages and working conditions throughout his district.

In contrast with complete unionization of the building trades, the contractors attain no equal solidarity for themselves. About 45 contracting firms are members of the Builders' Association, but as many more prefer to remain outside the association. The normal independent attitude of contractors, stimulated and encouraged by the sharp competitive bidding which characterizes the business, probably serves to keep these firms from joining in the

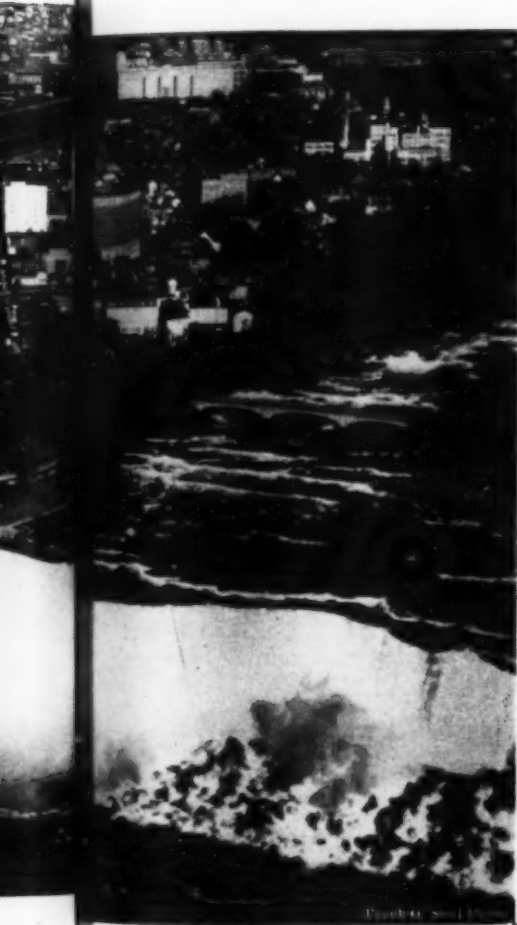
association's work, although they abide by, and derive equal benefit from, the labor agreements.

Former Relations

No definite plan lay before the contractors when they first began to work toward better labor relations more than 15 years ago. Conditions at that time were so bad that the contractors were practically forced to seek some improvement. Labor had been thoroughly organized in the city, but it was led by impetuous and belligerent men who had completely antagonized the contractors. Strikes were called without notice and were settled with great difficulty because of the distrust and suspicion on both sides. Fortunately the ranks of both contractors and unions received needed fresh blood at this time in the form of leaders who were capable of a sane and sympathetic approach to their common problems. Assisted by the moderate element among the older group, these men began their long struggle toward better labor relations.

Up to that time the contractors had followed no policy except one of instinctive resistance. As some of them succinctly describe the situation, they were bears on the market then, just as they are always, selling finished products for future delivery. Any rise in wages hit them in the pocketbook, and they resisted the blow even when the rising cost of living actually entitled the workers to larger increases than were being demanded. Workmen had to strike to get an equitable wage, and large losses were suffered on both sides.

Under the influence of unprejudiced new leadership, both contractors and unions began to discard the policy of unthinking opposition and to substitute a system of arbitration which would permit making adjustments without stopping work. Both sides regarded the first agreements with suspicion. Confidence replaced the original distrust only because earnest and sincere men on both sides worked untiringly to make arbitration a success and to create a feeling of complete respect for written agreements.



committees for the arbitration of disputes as they arise, with the same members frequently serving on successive committees. On the part of the contractors an effort is made to keep the means of arbitration alive and in good working order by bringing frequent disputes, even of minor nature, before the arbitration board for settlement. Putting a dispute before the arbitration board of each trade every 2 or 3 months helps to keep the machinery in good operating condition.

A section of the carpenters' agreement shows how disputes may be brought to the attention of the arbitration board. This section says: "The



STABLE LABOR CONDITIONS enable Niagara Falls construction jobs to proceed without fear of strikes or unexpected changes in wages and hours.



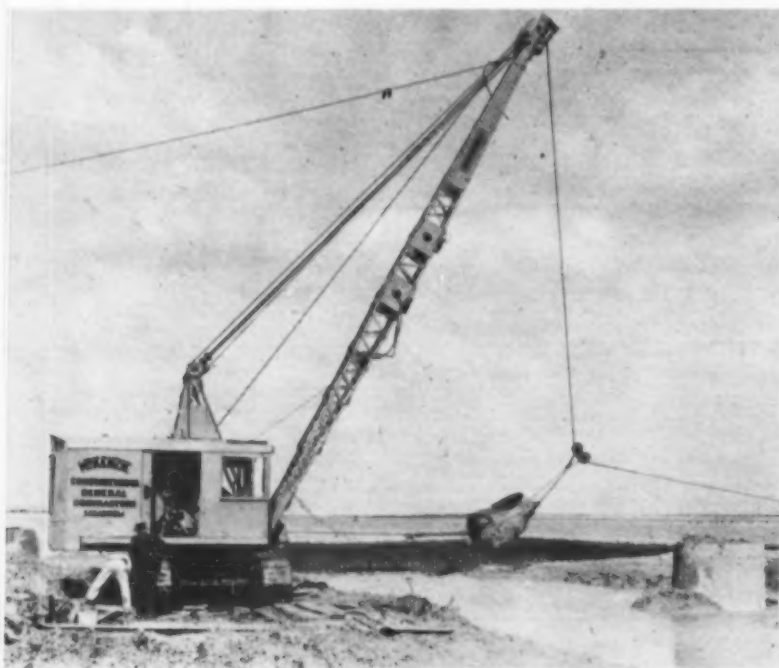
SHIELD comprising two 1/4-in. steel plates 10 ft. high and 12 ft. long is attached to boom of ladder-type ditcher.

BY FITTING a steel shield on the boom of a ladder-type ditching machine to aid the placing of solid sheeting and by installing well points alongside the trench to hold groundwater in check, the McKenzie Construction Co., contractor, of San Antonio, Tex., under the direction of Harrington & Cortelyou, Kansas City, Mo., consulting engineers, laid several miles of sewer in quicksand below sea level for the city of Corpus Christi, Tex., on the coast of the Gulf of Mexico. Of 17 mi. of vitrified clay pipe collecting sewers included in the McKenzie contract, 8 mi. had to be laid below sea level. These sewers ranged from 8 to 21 in. in diameter.

In addition to the 17 mi. of sewers added to the city's sanitary system, the contract called for the construction of a sewage treatment plant (designed for a future population of 125,000 people) and 1 1/2 mi. of 36-in. concrete pipe gravity outfall line from the plant



WELL-POINT SYSTEM dewater 6-ft. trench being excavated to depth below sea level by small ladder-type ditching machine. Men seated by pump are waiting for change of shift.



SLACKLINE CABLEWAY EXCAVATOR operated by dragline machine digs underwater channel crossing for 36-in. outfall at El. -42. Gasoline hoist engine on other side of channel pulls bucket out on slackline. Operator of this hoist engine receives his signals by signal arm mounted on cab of dragline.

to Nueces Bay. Two of the disposal plant structures had bottom slabs at El. -14.5 and El. -10. The outfall line included a 500-ft. section of cast-iron pipe crossing under a ship channel. One part of the collecting system called for 500 ft. of 10-in. cast-iron force main crossing under the channel and delivering sewage pumped to the plant from the low-lying north section of the city.

A rapid increase in Corpus Christi's population, signalized by a jump from 12,000 to 70,000 in 10 years, largely as the result of rich oil discoveries just outside the city limits, made it imperative that the sanitary sewage collecting system be extended to serve the expanded residential and industrial districts. Of equal importance was the construction of a complete treatment plant to replace the existing disposal station, which did little more than screen the sewage before discharging it into the bay. On the basis of studies and designs prepared by the consulting engineers, PWA furnished a loan and grant to finance construction of sewers

and complete sewage treatment plant.

Construction Organization—Three complete construction crews, comprising trenching machines and pipe-laying gangs, excavated trenches and placed pipe at rates ranging from 100 to 1,000 lin.ft. per day, depending upon soil conditions, depth of trench and size of pipe. Corpus Christi faces east on the curving waterfront of Corpus Christi Bay. Construction conditions varied in the four districts into which the collecting system was divided.

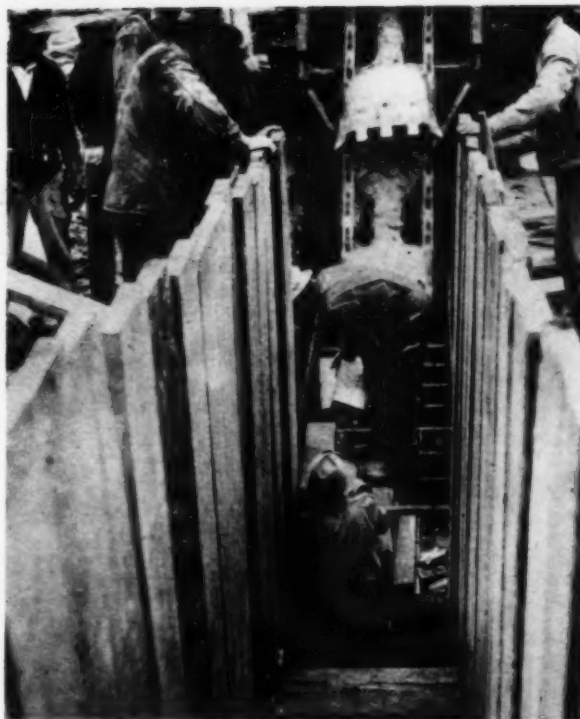
Most favorable trenching conditions were encountered in the fast-growing southwest residential district, where all sewer lines were above water level. Here the three construction units operated on different depths of trench. A wheel-type trencher dug ditches to 4-ft. depth. For trenches 4 to 8 ft. deep, a second crew used a small ladder-type ditcher. The deepest trenches, ranging from 8 ft. to a maximum of 20 ft. in depth, were excavated by a large ladder-type machine. All three trenching machines operated with two 5-hr. shifts, and each crew averaged more

than 1,000 lin.ft. of sewer per day.

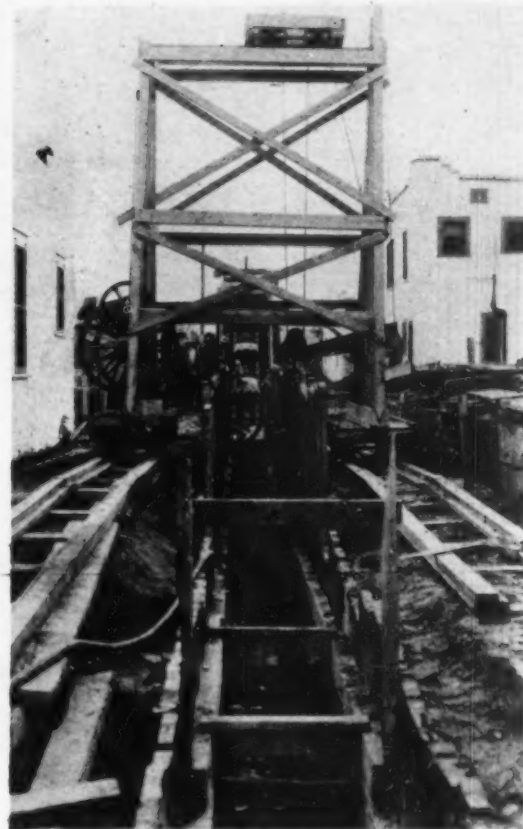
Less favorable conditions were encountered in the west and northwest districts, embracing an industrial section of low-lying mud flats adjacent to the dredged ship channel. The wheel trencher and smaller ladder-type machine excavated the sewer trenches in this area, each unit averaging about 800 lin.ft. of 8-in. sewer per day.

North Beach Sewers — Separated by the ship channel from the rest of the city, the low, sandy North Beach district presented the most difficult trenching conditions. Practically all of the North Beach system, aggregating about 6 mi., was laid below sea level. Some parts of the system were located within 50 ft. of the bay, and 2,000 ft. of the sewers averaged more than 8 ft. below sea level. A well-point system was used over the entire district to give a dry ditch for sewer construction, and all pipe was laid with calked asphalt joints.

Trenches to 6-ft. depth were excavated by the smaller ladder-type machine, which made average progress of 300 ft. of 8- and 10-in. sewer per day. Deeper trenches, to a maximum depth of 16 ft., were cut by the heavier ladder-type unit, using the steel shield anchored to the boom to support the wet, loose sides of the trench while workmen placed 2-in. sheeting. Two



IN WAKE of steel shield in 16-ft. trench, workmen place temporary spreaders to hold walls of solid sheeting until rangers and trench jacks can be installed. This trench is kept dry by well points jetted to El. -15.



IN PARTICULARLY BAD GROUND, with bottom of trench at El. -15 in quicksand, contractor drives solid sheeting to greater depth with air-operated double-acting hammer hung from trolley carriage on rolling gantry.



IN HYDRAULIC FILL steel shield holds sides of trench against heavy pressure while workmen place solid sheeting.

men in the shield set 2x12-in. rough sheeting, while two men in the trench behind them placed rangers, trench jacks and spreaders.

The deep trenches were sheeted solid to hold the sides of the trench against the large amount of quicksand and water encountered at the greater depths. As soon as the trench had been back-filled, the sheeting was pulled to be used again.

Average progress with the large ditching machine and shield in this extremely bad ground was about 125 ft. per day. Particularly rapid progress

was made on one 160-ft. section of trench 14 ft. deep, with the lower 10 ft. in quicksand dewatered by well points. The ditcher excavated 36-in. trench on this section in 2 hr., while the regular crew in the shield and trench set sheeting and trench jacks.

Success of the well-point system in dewatering the trench depended upon tide elevations and upon wind and weather conditions on Corpus Christi Bay. The contractor used 56 well points jetted to a depth of about 4 ft. below the bottom of the trench. A special well-point pump, equipped with a

TIMBER SHEETING (right) is placed in tail of steel shield while plates support wet, loose sides of trench in bad ground.



high-vacuum attachment for removing air from the system, was supplemented by five duplex plunger pumps. In the opinion of F. S. Oldt, superintendent for the McKenzie Construction Co., the completion of the North Beach sewer system would have been extremely difficult, if not impossible, without the assistance of the well points and the steel shield on the trenching machine.

Outfall Line — Extending from the disposal plant across mud flats in the



OUTFALL CONSTRUCTION involves placing of 36-in. reinforced-concrete pipe sections in solid-sheeted trench excavated at this point by dragline bucket and drained by duplex plunger pumps. Timber stiff-leg derrick mounted on skids handles pipe sections.

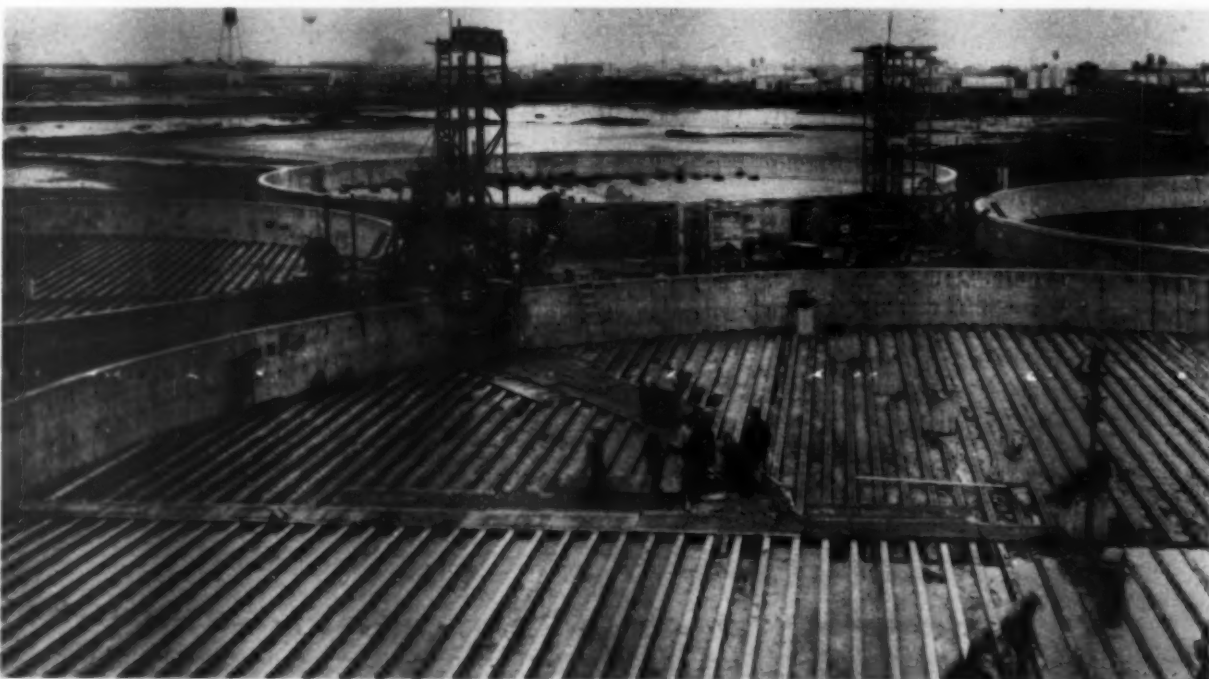
vicinity of the inner ship channel and turning basin, the outfall line was subject during construction to flooding caused by high tides and resulting changes in the groundwater level. For 7,210 ft. from the plant, the line consists of precast reinforced-concrete pipe made and delivered to the site by the Gifford-Hill Pipe Co., Dallas, Tex. The entire outfall is below sea level, with the flow line at average El. -5. It continues for 512 ft. under the ship channel as a siphon of 36-in. cast-iron pipe and finally discharges plant effluent to an outfall channel emptying into Nueces Bay. Installation of the cast-iron section of the outfall, as well as of the 10-in. cast-iron force main already mentioned, was sublet to the San Jacinto Construction Co., Houston, Tex.

A gasoline crawler crane working on double mats excavated the outfall trench with a $\frac{3}{4}$ -yd. clamshell bucket. It was necessary in this trench to use solid sheeting of 2x12-in. timber which was driven with pneumatic piling breakers equipped with sheeting heads and supplied with air from a 220 c.f.m. portable compressor. A skid-mounted timber stiff-leg derrick with a 24-ft. boom operated by a two-drum hoist engine laid the pipe sections. To complete the outfall in the contract time of 10 months, with no allowance for any adverse weather conditions except hurricanes, the contractor used three 6-hr. shifts and made average progress of 110 ft. per day. Methods utilized by the subcontractor at the channel crossing are indicated by accompanying photographs.

Disposal Plant—Located on mud flats near the junction of two railroads about 3,000 ft. from the ship channel and turning basin, the disposal plant



INDUSTRIAL RAILWAY TRAIN of seven $1\frac{1}{2}$ -yd. side-dump cars delivers crushed limestone to filter beds at average rate of 95 cu.yd. per hour. Drain tile in floor is protected by hand-placed stone.



BETWEEN LINES of filter drain tile on floor of trickling filter, concrete crew places shell concrete filler distributed by hand carts from timber hoist tower. Two concrete hoist towers serve four filter tanks.

comprises a pumping station, two clarifiers, two digesters, one sludge drying bed, four circular rock filters and one final sedimentation basin. The plant required 6,500 cu.yd. of concrete, 40,000 lin.ft. of filter drain tile and 20,000 cu.yd. of crushed limestone rock in the four trickling filters, and 2,330 cu.yd. of mixed sand and gravel in the sludge drying bed, in addition to pumps, pipe, valves and other mechanical equipment.

Bottom slabs of the pump sump in the pumping station and of the final sedimentation basin were constructed well below sea level in quicksand. The contractor drove 2x12-in. timber sheeting around each of these areas with a light double-acting pile hammer operated by compressed air. Two vertical-shaft electric pumps dewatered the surrounding soil, and a crane excavated for each unit with a $1\frac{1}{4}$ -yd. clamshell bucket.

In the pump sump, the bottom of the slab is at El. -14.5 and the top is at El. -12.0. Keyed construction joints were used to make a watertight connection between the concrete walls and floor slab of the sump. Keys 2 in. deep were formed in the floor slab by placing beveled 2x4's while the concrete was soft. By placing 3 in. of sand-cement grout in the bottom of the wall forms before starting to deposit concrete, the constructors obtained a watertight joint through which not a drop of moisture penetrated during the succeeding months. An asphalt waterproofing compound was mopped on the outside of the walls.

High tide conditions caused difficulties in placing the 55-ft. circular floor, 15 in. thick, of the sedimentation basin, with the bottom at El. -10. To control flowing quicksand in the bottom of the excavation, the contractor covered the area with 10 tons of hay and laid a floor of 1-in. lumber on top of the hay, omitting planks where necessary to allow the insertion of hoses

used in pumping out quicksand to lower the platform to true grade. Concrete was placed on the plank floor from a dump bucket handled by a crane. Permanent relief valves, installed in the slab to prevent its floating, started to flow before the last of the concrete had been placed.

Concrete and Forms — With the exception of 600 cu.yd. of 1:1½:3 concrete in the digesters, all the concrete in the plant (totaling 6,500 cu.yd.) was designed as a nominal 1:2:4 mixture. Aggregates were measured by a highway batching plant and were delivered in two-batch trucks to a 14S mixer which operated under a 1½-min. mixing requirement.

Because of the scattered location of the plant units, the contractor used four elevator towers for concrete, two at the filters, one at the digesters, and one at the main pumping station. Pneumatic-tired wheel-barrows and steel-tired carts placed concrete in these structures. In the other units, concrete was placed by crane and dump bucket. Specifications prohibited dropping concrete more than 5 ft.

Sectional wood panel forms were used repeatedly in building various plant units. A single set of forms, built in panels on a 160-ft. radius, served the four filter tanks. Forms for the two digesters were built in 6x24-ft. panels and were used twice. A crane transferred the panel forms from one digester to the other, together with portable scaffolding and temporary runways used in placing concrete and in hanging and welding 2-in. hot water pipe on the walls. After being cut to proper length, these forms served again in constructing the sedimentation basin and the two clarifiers, which are structures of identical diameter.

Filter Rock — In the four trickling filters the contractor placed 20,000 cu.yd. of crushed limestone rock, 1- to 3-in. size, in 50 working days at an average rate of 95 cu.yd. per hour. Crushed rock was delivered in self-



CAST-IRON SECTION of 36-in. outfall, 512 ft. in length, is floated on pontoons with sufficient buoyancy to support 113 tons of metal pipe. Line is lowered to final position 40 ft. below surface by pumping pipe full of water.



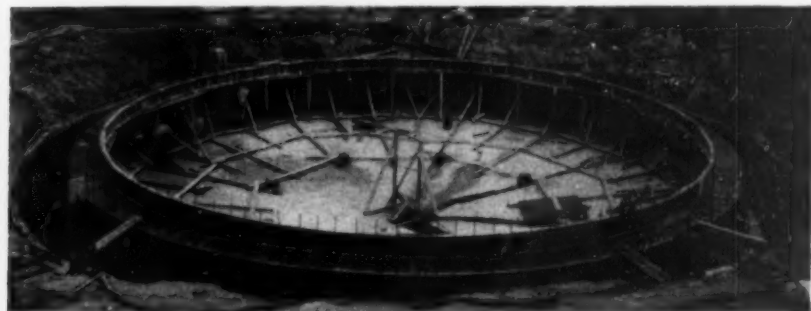
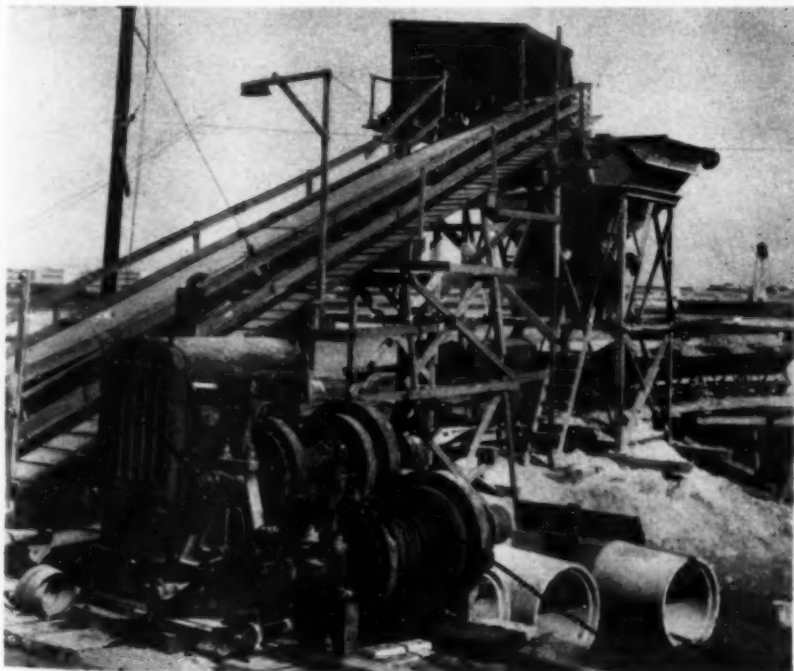
TRACK HOPPER feeds crushed limestone rock from self-cleaning hopper-bottom cars to belt conveyor.

cleaning hopper-bottom railroad cars which discharged the material into the boot of an 18-in. x 80-ft. belt conveyor delivering to 30-cu.yd. overhead steel bins. These bins fed the stone through batching hoppers into 1½-yd. side-dump cars of an industrial railway used to haul the material into the filters. A 7-ton gasoline locomotive handled a seven-car train of the side-dump cars.

Two men took charge of all operations involved in transferring rock from the standard-gage hopper cars to the 24-in.-gage side-dump cars. One of the men dropped the railroad cars down an easy grade to spot them over the track hopper and, also, operated the 80-ft. conveyor. The second man loaded the side-dump cars out of batchers under the overhead bins.

Direction — Don F. Allen, resident engineer, was in complete charge of all operations on the Corpus Christi sewerage system and treatment plant for Harrington & Cortelyou, of Kansas City, Mo., consulting engineers. Construction work was directed for the McKenzie Construction Co., contractor, San Antonio, Tex., by F. S. Oldt, superintendent. The Public Works Administration was represented by A. E. Wood, resident engineer-inspector.

UNLOADING PLANT (left) for crushed limestone rock going into filter beds utilizes belt conveyor to deliver rock from track hopper to steel bins of batching plant. Batch operator loads side-dump cars of industrial railway delivering rock to filters. Hoist engine in foreground is used for switching standard-gage cars.



FINAL SEDIMENTATION BASIN, constructed 90 per cent below sea level, has circular walls formed with sectional panel forms cut to proper length after prior use on digesters. Note relief valves in floor slab to keep slab from floating.

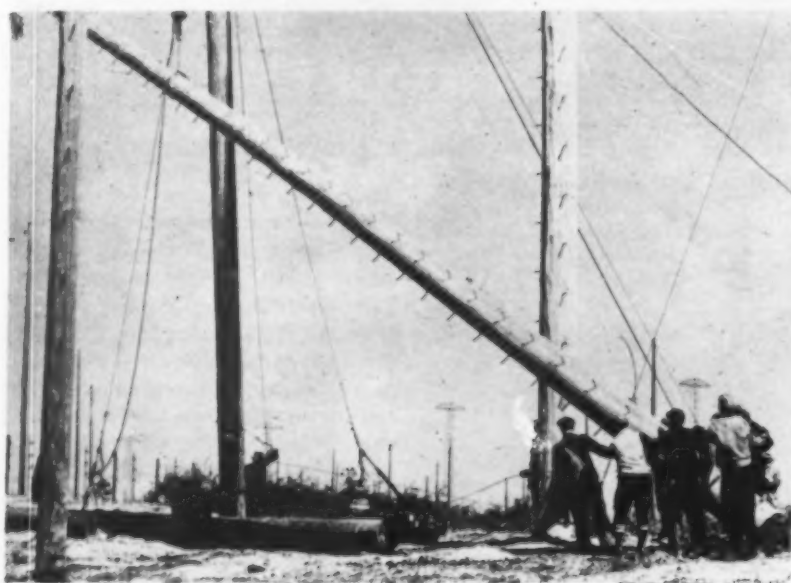
STEP by STEP FIELD METHODS

Poles for Radio

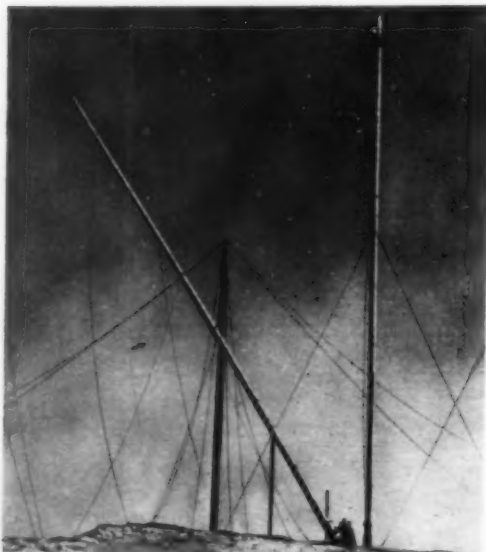
Up in Three Minutes

WITH THE methods and tackle illustrated in the accompanying photographs a rigging crew of RCA Communications required only about 3 min. each to raise 130-ft. Douglas fir poles for a radio antenna system at Riverhead, Long Island, N. Y. Erection was done with the aid of a 75-ft. gin pole, powered by a tractor, which hoisted the 4-ton masts into vertical position. They

were then seated in concrete bases and securely guyed with wire cables. The gin pole was mounted on skids so that it could be moved from one pole location to another by the tractor. In all, 23 of the 130-ft. poles were set, together with more than 200 others of lengths ranging from 65 to 130 ft. The new antenna system carried by this forest of tall masts will be used by RCA for trans-oceanic broadcasting.



1 START OF POLE RAISING takes place as hoisting line from tractor-powered gin pole picks up 130-ft. mast from ground.



2 GIN POLE (left) 75 ft. in height employs tractor power for hoisting mast, as rigging crew guides butt toward concrete base.



3 ERECTION to vertical position nearing completion for mast in center of row already in place.



4 RIGGER (left) climbs 130-ft. mast to disconnect tackle from gin pole hoist.

5 GUY ROPES from tops of masts are tightened and made secure by cable clips.



6 BUTT of mast in raised position is swung over and stepped in concrete base.



7 JOCKEYING of mast butt into its seat is done by rigging crew equipped with lumberjacks' peaveys.



8 GUY ROPE CONNECTION to mast is made with adjustable, bolted steel clamp encircling pole.

A SIMPLE WAY to determine the amount of "free" water and "absorbed" water in sand used in a concrete mixture involves the use of a small cone lightly tamped with sand. This method has been developed by the U. S. Bureau of Public Roads. Using this test it is easy to produce a condition in which the pore spaces in the sand grains are completely filled with water without any "free" water adhering to the surfaces of the particles. The moisture present when the sand is in this condition is called the "absorbed" moisture. Any excess over this amount is called "free" moisture. Bureau engineers point out that the test makes possible a much simpler and a more accurate method of making al-

lowance in the water added to a batch of concrete for variations in "free" moisture in the sand. The test is useful both in the laboratory and in field control of concrete mixtures.

It is the so-called "free" moisture in concrete mixtures that dilutes and

weakens the cement paste. Only a small part of the water used in mixing concrete is needed for complete hydration of the cement. The rest of the water lubricates the mix so that it may be placed uniformly and without difficulty. Free moisture in sand in unknown

quantity upsets the scientific proportioning of concrete.

The test was developed by D. O. Woolf, associate materials engineer in the Bureau. Moist sand containing free water can be shaped into molds by light pressure. Dry sand cannot be molded. After experimenting with cones of many shapes, Mr. Woolf found that sand—lightly tamped into an inverted cone with a top diameter of $1\frac{1}{2}$ in. and a bottom diameter of $3\frac{1}{2}$ in.—contains free moisture if it holds its shape when the cone is removed. At the point where the sand slumps upon removal of the cone, free moisture is gone. The cone test has been adopted by the American Association of State Highway Officials.

Simple Sand Test Cuts Concrete Guesswork



SAND is lightly tamped into mold in form of inverted cone with $1\frac{1}{2}$ -in. top and $3\frac{1}{2}$ -in. bottom diameters and height of $2\frac{7}{8}$ -in.



FREE MOISTURE is indicated if sand holds shape after removal of cone-shaped mold.



SATURATED or surface dry condition is indicated if cone slumps when mold is removed.

TRACTOR WEIGHT SAVED IS

Extra

MODEL "L-O"

These "L-O" Oil Tractors are hauling slate on a road job in Maryland. A-C BALANCE means tractor weight saved, quicker pick-up, faster hauling and lower costs.

ALLIS-CHALMERS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

Controlled
OIL TRAC


-TIMED RIGHT TO FIRE

S payload *load* GAINED

YOUR tractor moves two kinds of weight—dead load and payload. Each costs money to move, but only payload pays dividends. Every pound of dead load eliminated from the tractor means an extra pound of payload hauled.


Excess tractor weight is reduced through proper balance between power, speed and weight. Allis-Chalmers pioneered the BALANCED tractor—it was the Model "35" (now the "K") and the Model "L" which completely changed the trend of tractor design and performance. These and other A-C Models have led the way to a new kind of higher-speed, lower-cost dirt moving. These tractors speed up your job because they are designed to give maximum performance in the higher speeds—the speeds at which you do more than 90 per cent of your dirt-moving work.

Get the complete story on what A-C BALANCE means—in reduced investment, wider usefulness, higher speeds, quicker pick-up, better hill climbing, fuel savings, less maintenance—and lower bidding. Tractor weight saved is extra payload **GAINED!**



MODEL "K-O"

Because of their BALANCE, A-C Tractors have never been equalled for bulldozing. This "K-O" Oil Tractor is feeding a gravel plant at Garfield, Utah.



MODEL "S-O"

Time saved to and from the fill; lower cost per yard. That's what A-C BALANCE means in this "S-O" Oil Tractor, owned by Isabella County, Mich.

d Ignition
ACTORS
RE THE RIGHT TIME

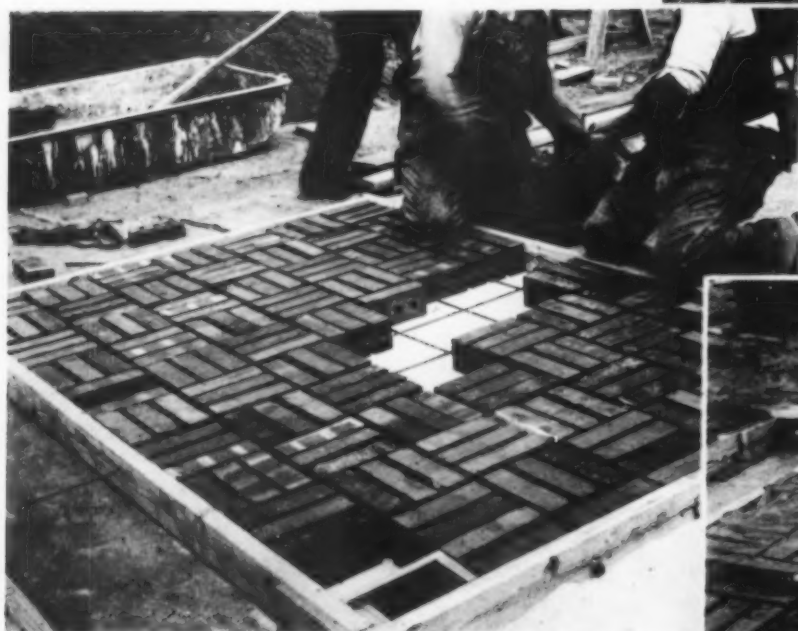


Precast Brick Panels

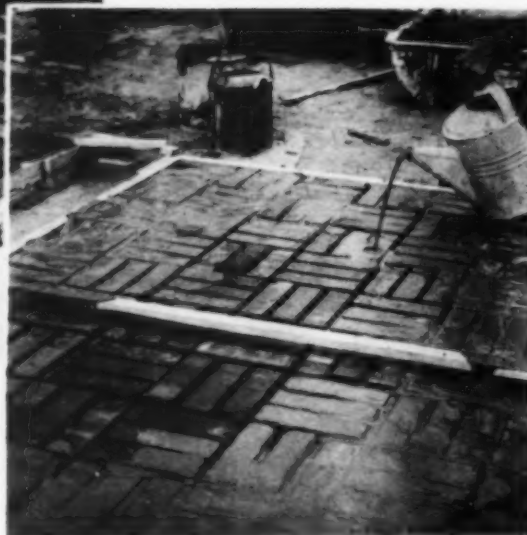
Form Load-Bearing Walls for Houses



COMPLETED HOUSE of reinforced brick panel load-bearing wall construction, with cantilever feature at second floor level over doorway. Architects, Holsman & Holsman, of Chicago.



MAKING OF PANEL is done by assembling brick within wood forms on screeded sand base. Note steel reinforcing rods between joints in basket weave pattern of brickwork.



GROUTING OF JOINTS in brick panel is done by pouring cement-sand mixture from cans, filling spaces between brick and embedding steel reinforcing rods.

bearing partition walls are of a type of construction similar to that of the exterior walls. The reinforced brick-panel type of wall eliminates the need for either wood or steel studding and for additional courses of back-up masonry. Only standard brick, obtainable from any material dealer, is employed.

Floor slabs not on the ground are of reinforced concrete about $3\frac{1}{2}$ in. thick poured on steel pans and anchored by reinforcing rods to the exterior load-bearing brick walls and partitions.

As designed by Holsman & Holsman, Chicago architects, houses of the type illustrated embody cantilever construction, giving an overhang of the second story, breaking the wall facade



PANEL UNIT is erected in wall with aid of hand-operated pole derrick. Surface carrying excess joint grout will form rear of wall, with clean brick on exterior.

FOR LOAD-BEARING WALLS of two-story residences the Chicago Face Brick Bureau is sponsoring a type of construction involving the use of brick precast into panels containing as many as 300 brick, reinforced with steel bars and grouted at the joints with a mixture of cement, lime and sand. The wall panels have a thickness of 4 in., are one story in height and several feet in width. As illustrated in the accompanying photographs the panels are made by laying brick on edge in a form, placing $\frac{1}{4}$ -in. steel reinforcing rods on $8\frac{1}{2}$ -in. centers horizontally and vertically at the approximate center of the panel thickness. The reinforcing rods extend beyond the panels to provide for anchorage of floor slabs, window sills, etc. Joints between panels in walls are filled with mortar and mastic. All parts of the wall construction are tied together with reinforcing rods. Load-



SETTING a panel in wall upon concrete foundation using pole derrick.



GANTRY with traveling chain hoist is another method of setting brick panels in place.



INTERIOR PARTITIONS are of same general type of panel construction as exterior walls. Brick bonded on edge, four brick per sq. foot.

and providing additional floor space. Pattern brickwork is not confined to basket weave, although this was used because it was cheapest; running bond brickwork may also be employed.

Floor loads for these houses are set at 100 lb. per square foot. The Federal Housing Administration has approved for mortgage insurance this panel type of construction for one and two-story residences, each property being considered on its own merits.

In precasting the panels the brick are placed face downward within forms on a screeded sand bed, with $\frac{1}{4}$ -in. steel reinforcing rods in the mortar joints spaced on $8\frac{1}{2}$ -in. centers. There are six brick per square foot. When all brick in a panel form are set, cement grout is poured on to fill the joints and embed the steel reinforcing bars. When the grout has set the panel is lifted from its sand bed and erected with the aid of a pole derrick as part of the building wall. Panels forming corners are dovetailed. Costs of homes embodying the reinforced wall-bearing brick panel construction have ranged from \$4,500 to \$6,250.

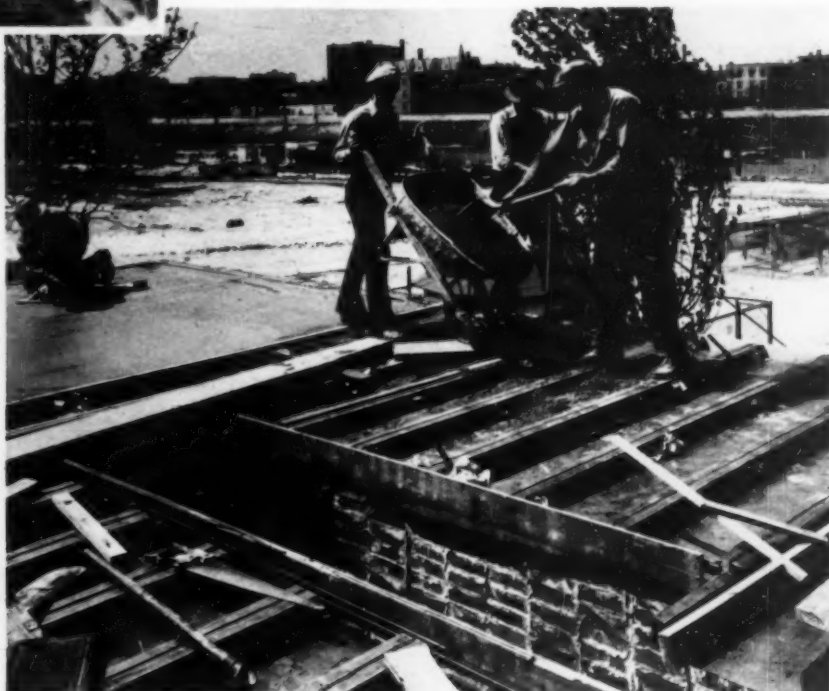


FIRST FLOOR is of brick panels, with brick bonded on edge. Surface is later terrazzo ground and waxed.

DOVETAIL CONSTRUCTION (left) is employed at corner joints between panels.



STEEL I-PANS, 4 in. deep, are set to serve as forms for concreting and reinforcing second floor of house. Pans are spot welded and bolted to walls.



FILLING steel I-pans with lightweight Haydite concrete, which is trowelled smooth to form second floor surface or open roof deck.

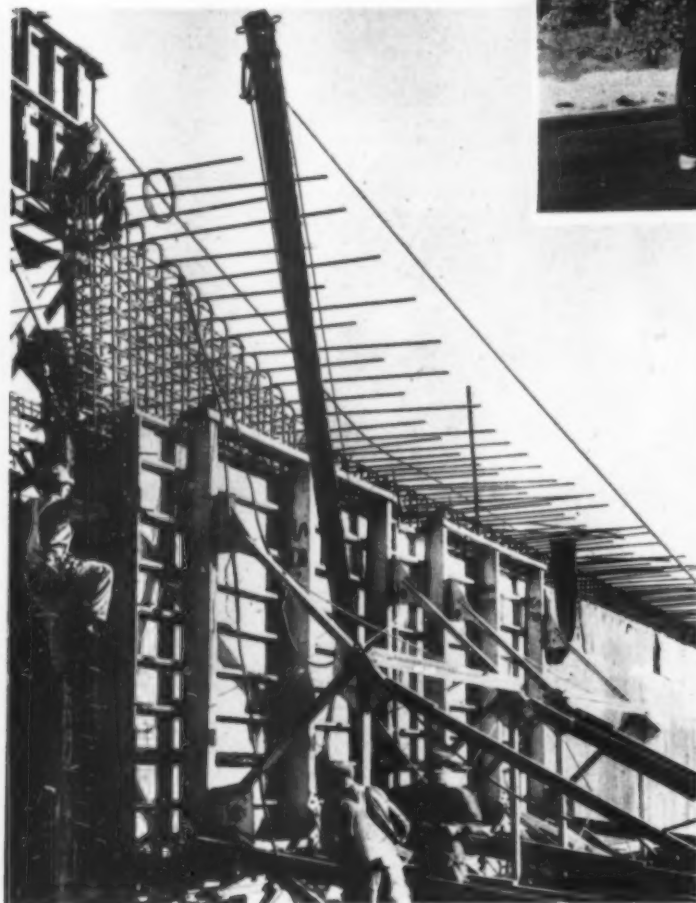
How They Did It—

CONSTRUCTION DETAILS FOR *Superintendents and Foremen*



SPECIAL ANCHORS

are set in ground too soft for deadmen to swing digging end of hydraulic dredge back and forth across width of cut for Lake Calumet terminal of Lakes-to-Gulf waterway at South Chicago, Ill., for which Al Johnson-La Crosse Dredging Co. are the contractors. Anchor consists of braced T-shaped steel frame with steel arm terminating in spade-shaped section set at angle to main frame. Pull on anchor line sinks spade section into ground, allowing T-frame to act as blade to resist pull of 60,000 lb.



SETTING FORMS

for concrete walls of wash siphon on All-American canal, being constructed by U.S. Bureau of Reclamation in Southern California desert west of Yuma, Ariz. Siphon will carry wash across canal.



PORCELAIN ENAMEL

on Armco ingot iron sheet metal of 16 gage forms exterior facing of new \$100,000 Greyhound bus terminal building in Louisville, Ky. Colors of Porcelain Metals Corp. enamels are dark blue, light blue and white. Structure built by Dahlem Construction Co., of Louisville, accommodates seven buses in 139-ft. loading zone in rear of building.



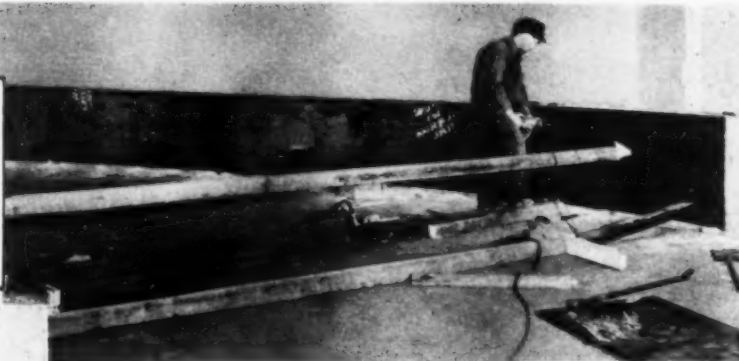
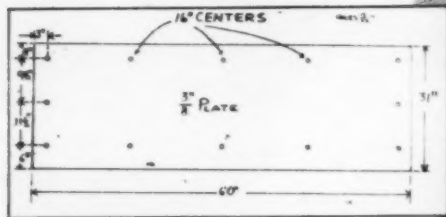
LIGHTWEIGHT, FOLDING SURFACE TESTER

holds favorable place in opinions of Michigan Highway Department engineers and inspectors, who have used it for several years. Portability, ease of adjustment and electric buzzer facilitate work of checking surface irregularities.



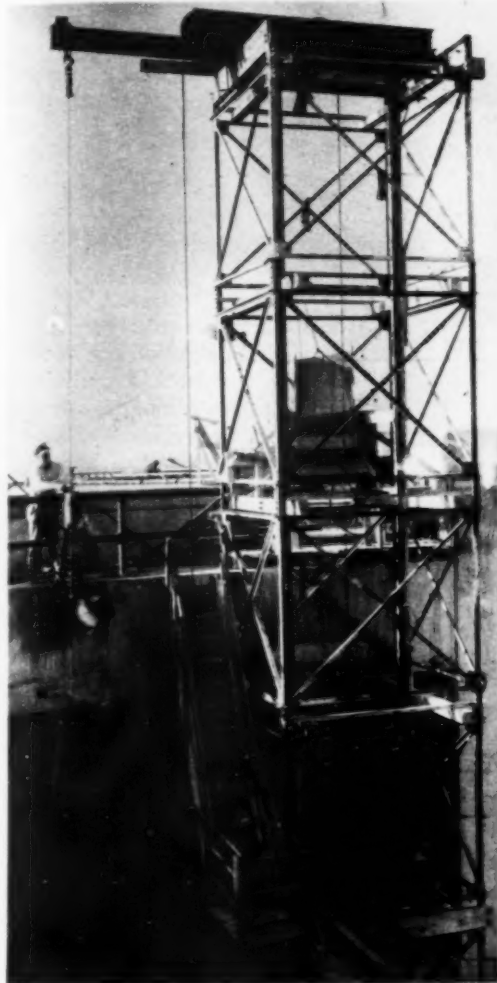
ROOF DETAIL

For covering Billy Rose's 5,000-seat marine theatre at Cleveland's Great Lakes Exposition galvanized corrugated sheet iron is suspended from frame of steel trusses. Between trusses are 2x8-in. wood purlins to the under sides of which metal sheets are nailed. General contractor for "Aquacade" structure was Hunkin-Conkey Construction Co., of Cleveland, with Halter & Sons Co. having subcontract for roofing.



WALL PROTECTION

along sharply curved truck ramp in City Auditorium in St. Louis, Mo., is afforded by $\frac{3}{8}$ -in. steel plates 6 ft. long and 31 in. high. Plates were curved to wall surface by screw-jacks behind 4x4-in. timbers, as illustrated. For anchoring steel plates to wall $\frac{3}{8}$ -in. holes were drilled, as shown in sketch, and into them $\frac{3}{8}$ x2-in. Rawl-Drive expanded bolts were driven by blows from hammer to hold protective plates securely in place.



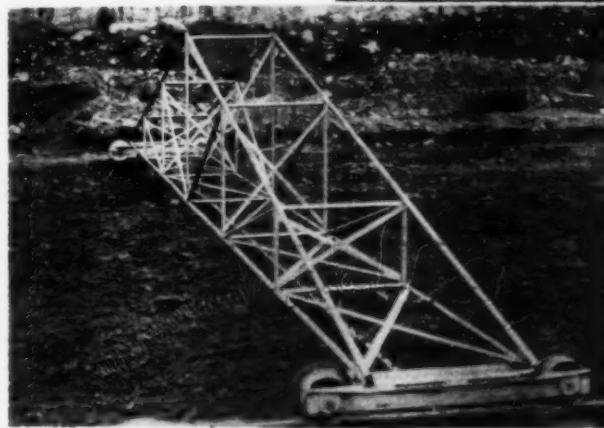
WANTED — Photos of Details

The Editor of **CONSTRUCTION Methods and Equipment** wants photographs or sketches illustrating interesting **DETAILS** of method or equipment and will pay for those he finds acceptable for publication.
Haven't your job produced some **DETAIL** that might be illustrated on this page? Send along a picture of it; we'll return it promptly if we can't use it.



RAILROAD RAILS

curved to form arch, support concrete slabs of light bridge floor at Silver Springs, Fla. Rails are anchored in concrete at ends and are spaced by light tierods to prevent spreading. Bridge hand rails also are of railroad rails of steel.

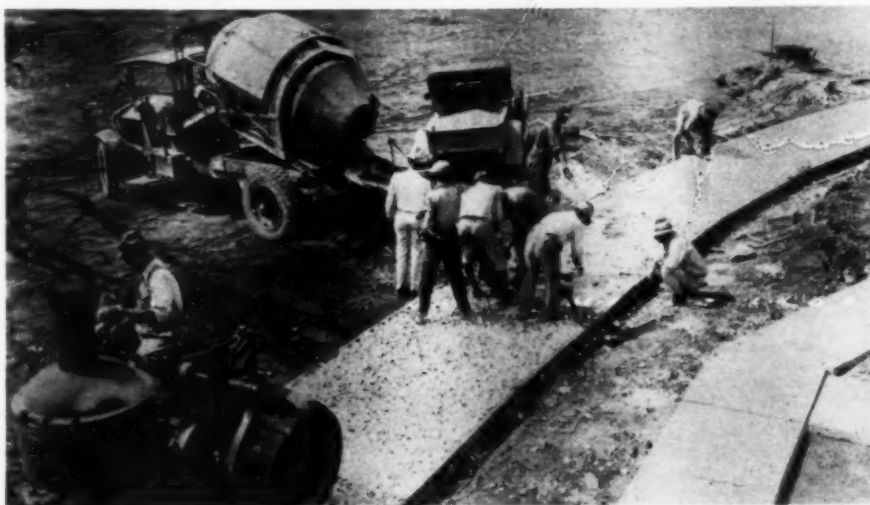


TEMPLET

in form of steel truss mounted on flanged wheels riding on forms is used by B. Perini & Sons, Inc., contractors, of Framingham, Mass., to check accuracy of spreading gravel base for widening of Newburyport turnpike in Massachusetts. Row of spikes in horizontal member of 34-ft. span serves as scratch-board to test height of subgrade before bituminous paving is laid.

SUBSTANTIAL STAIRWAY

securely attached to steel hoist tower, is one of several safety features which help to keep accident figure low at Buchanan dam, being completed on Colorado River of Texas by Lower Colorado River Authority. Project will be described in detail in a future issue of *Construction Methods and Equipment*.



SMALL-SCALE PRELUDE

to actual construction of 16 mi. of 10-in. portland cement grout-bound broken-stone base on Texas route 66 makes use of sidewalk job at State Highway Department's division headquarters, San Antonio, to test grading, compacting and grouting of rock. As result of these tests, base on highway project is grouted to full 10-in. depth in one operation, instead of in two 5-in. layers, as originally proposed.



100,000-BBL. HORTONSPHEROID

takes shape at Port Arthur, Tex., with erection of interior framework on concrete base by Chicago Bridge & Iron Works for Warren Petroleum Co. Spence & Howe Construction Co., Port Arthur, drove 1,200 60-ft. foundation piles for tank, which duplicates first container of this type erected at Port Arthur in 1936, 50 ft. high and 140 ft. in diameter, designed to withstand pressure of 10 lb. per square inch. Resembling huge drop of mercury in shape, tank will store natural gasoline used for blending with refined gasoline to improve volatility of motor fuel.

HEAVY CONSTRUCTION

TWENTIETH
OF A SERIES OF
ARTICLES

Principles and Practices of Job Layout and Selection and Use of Equipment

ADOLPH J. ACKERMAN and CHARLES H. LOCHER
Construction Plant Engineer TENNESSEE-VALLEY AUTHORITY, KNOXVILLE, TENN. Construction Consultant

HEAVY-DUTY 60-in. gyratory crusher. (Allis-Chalmers) (right) for primary crushing.



• 20 •

Crushing, Screening and Storing of Aggregates



LARGE JAW CRUSHER of Pennsylvania make for primary breaking of rock.

CRUSHING AND SCREENING of aggregates may appear to be a rough and haphazard operation on a job, but it is actually a manufacturing process capable of scientific and accurate analysis.

In planning a large crushing operation the economics of quarrying are directly involved and govern the selection of the crushing machinery. A careful study of the best combination for primary and secondary crushing may justify the installation of a larger crusher to receive larger pieces of rock from the quarry, thus reducing secondary blasting. Such blasting gener-

ally costs about five times as much as primary blasting, and a reduction in this expense may justify a substantial increase in investment in the crushing plant.

The first step in planning a crushing plant should be the preparation of a line diagram showing the various steps of crushing and screening, as shown in the diagram herewith, taking account of the character of the rock, the quantity and rate of crushing, the economics of the quarry operation, and the desired sizes and gradation of products.

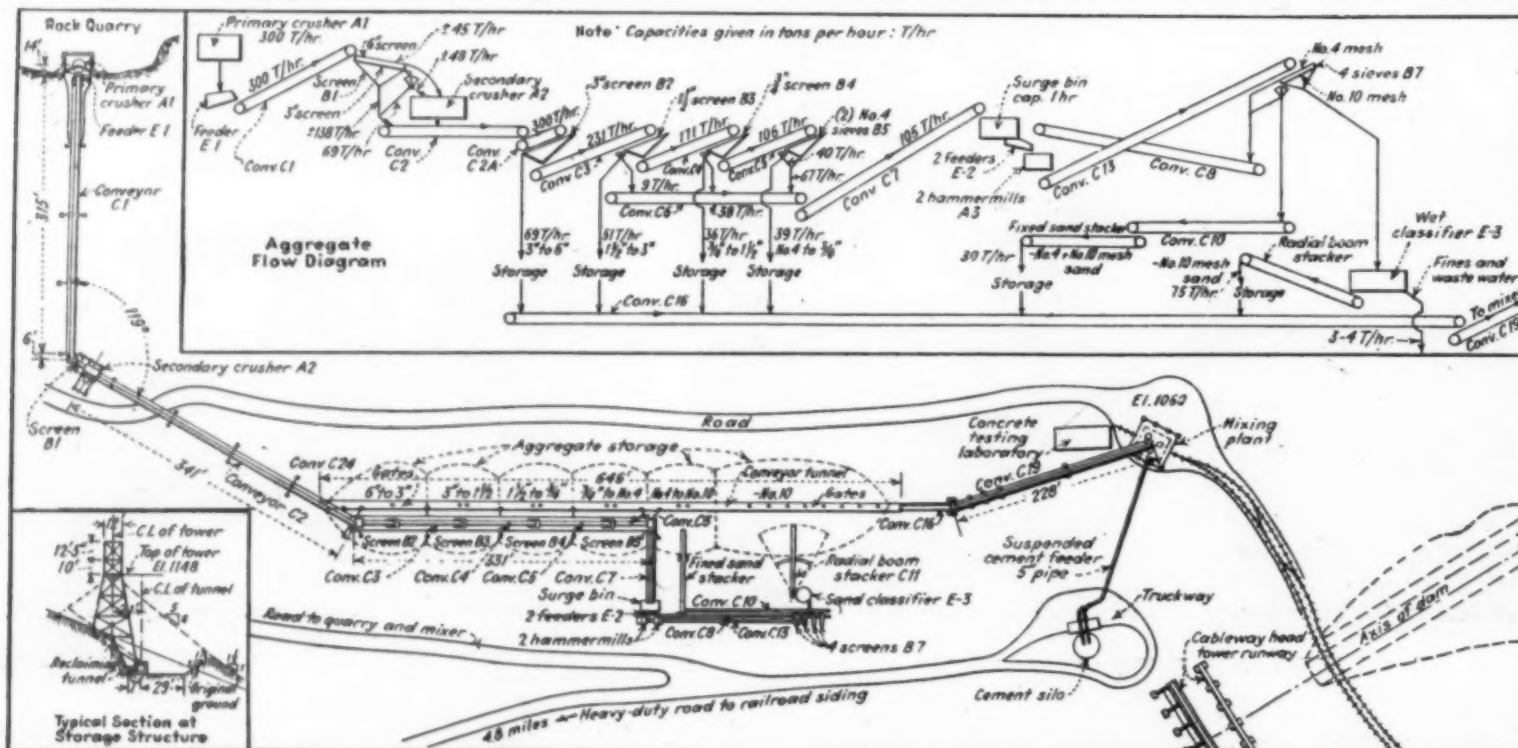
A crushing and screening plant should be designed with some excess capacity over the expected continuous consumption, because the intermittent feed into the primary crusher may cause surging overloads on the belt conveyors and screens. The plant should also be capable of catching up with consumption after major shutdowns.

A modern stone and sand crushing plant usually consists of the following component parts: Primary crusher, scalping screen, secondary crusher, belt conveyors, sizing screens, sand mills,

sand screens, classifiers or washers, storage piles, reclaiming system, and means for disposing of waste. In arranging these various parts accessibility, ease of maintenance, flexibility and the most direct means of handling the materials are major considerations.

Primary Crushers

The primary crusher of the jaw or gyratory type is installed with its top below the level of the quarry floor to permit direct loading from trucks, wagons or railroad cars into a hopper above the crusher. A jaw crusher can generally take larger pieces, but has considerably less capacity than a gyratory. The gyratory consists of a heavy conical head suspended from an overhead spider and designed to rotate with an oscillatory motion; it can take rocks up to 5 ft. in diameter in the larger sizes. Primary crushers should be equipped with reversing switches on the motors to release a stalled overload. However, sometimes this expedient is not sufficient, and a heavy hoist-oper-



AGGREGATE FLOW DIAGRAM (at top) used in planning crushing and screening plant for Norris dam; also general plan of adopted layout (at bottom).

ated hook suspended over the crusher is generally provided for pulling up oversized rock and elongated pieces which occasionally bridge the opening.

Where the product from the primary goes direct to a screening and secondary crushing operation its feed should be as constant as possible, and for this reason a storage pile beyond the primary is desirable. From this surge pile a mechanical or vibrating feeder and belts deliver the crushed material at a uniform rate to succeeding operations. The belt conveyor leading from the primary should be equipped with a magnet which removes metal, such as pieces of drill steel and bolts, which may damage the secondary machinery.

Secondary Crushers

The secondary crusher for breaking down oversize rock is usually of the gyratory or cone type, which has especially high capacity for making fines. A modification of the cone type is obtainable with a spherical head, known as the Gyro-sphere. A third type, known as a Newhouse, has a direct-connected motor drive and crush-

plates, thereby successively breaking the stone down to small particles; the larger sizes of this equipment have capacities of 40 to 50 tons per hour.

2. Ring crusher. This is similar to the hammermill except that in place of swinging hammers there are swinging annular rings.

3. Cone crusher of the Symons high capacity type with projecting shaft.

4. Gyrosphere, similar to cone with projecting shaft, but with a spherical head.

5. Bell head gyratory with suspended shaft.

6. Roll crusher, consisting of two steel cylinders rotating toward each other. The larger the pieces of rock in the feed, the larger must be the rolls.

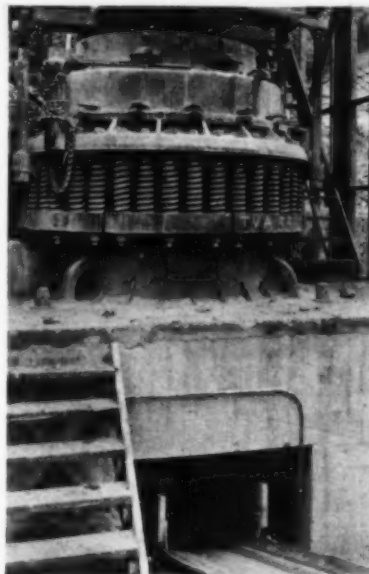
7. Rod mill, consisting of a horizontal revolving cylinder with a charge of steel rods which are constantly tumbling over each other, thereby crushing the rock. This type of equipment is only suited to special conditions.

The sand plant at Norris dam, designed by C. D. Riddle, is an outstanding example of a first-class sand-making installation. A great deal of

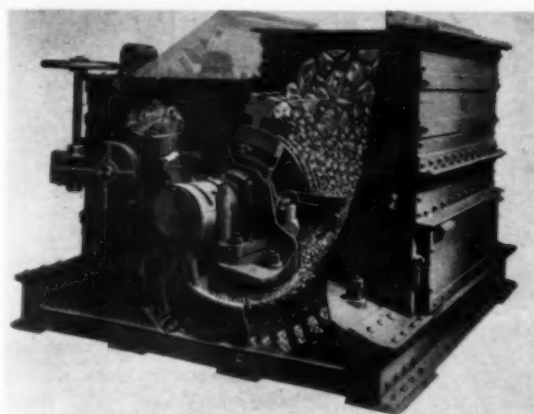
time and study was devoted in advance to a proper selection of the equipment and methods for producing sand. The rock was a dolomite with

from 2 to 6 per cent of silica. Particular study was given to the possible use of rolls, rod mills, hammermills and modified gyratories. The screen analyses of the products from various types of experimental mills were all similar in that there was a surplus of 8- and 14-mesh, and a deficiency of 28-, 48-, and 100-mesh material. There was, however, a great difference in the shape of the particles. The hammermill produced the best, a cubical shape; the gyratory gave a wedge, pyramidal or flat shape; the rolls produced a splintery shape. It was also found that a modified gyratory could produce a satisfactory product by employing a choke feed which developed the desired shape of product by attrition grinding. However, the setting of the discharge opening had to be larger than normal and produced considerable oversize for recirculation.

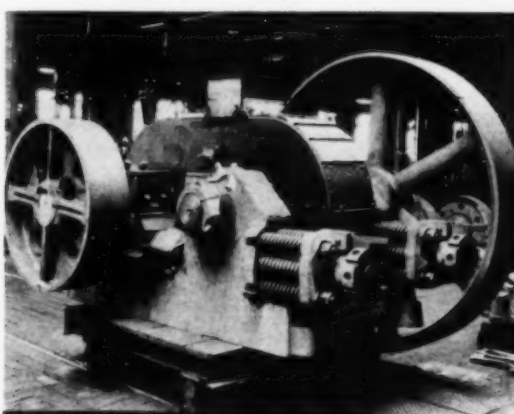
It is practically impossible to obtain the desired gradation directly from a sand-making machine, and it is therefore necessary to combine a very flexible screening arrangement with the sand-producing machinery. This is



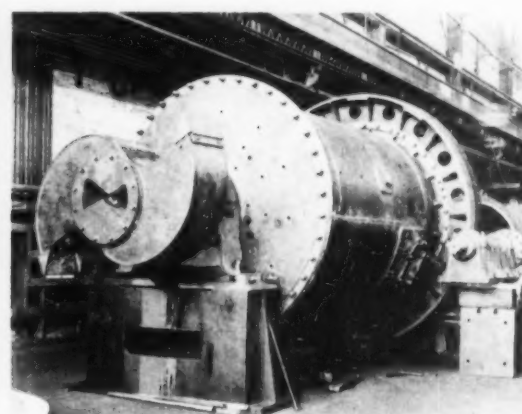
SECONDARY CRUSHER of Symons type installed at Norris dam to crush oversize product from primary rock crusher.



HAMMERMILL CRUSHER for reducing rock to small sizes of sand particles.



CRUSHING ROLLS for fine reduction of rock.



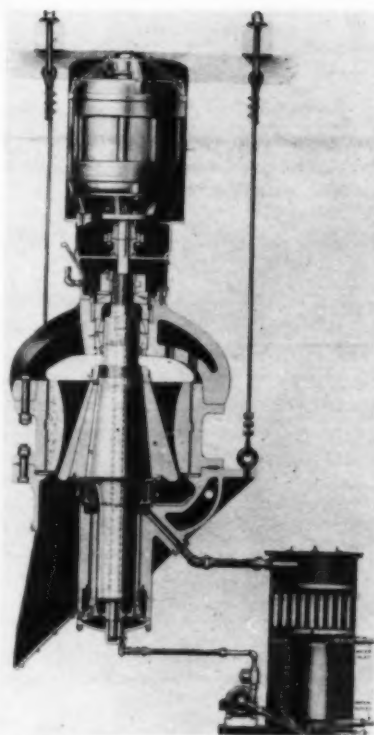
ROD MILL shop assembly for fine reduction of aggregates.

ing head. This type has capacities of 100 to 300 tons or more per hour and operates at high speed of rotation of the head, around 500 to 700 r.p.m.; it is designed for suspension from the building frame, thereby saving the cost of a concrete foundation. In order to reduce the load on the secondary crusher it is standard practice to scalp out the acceptable sizes of crushed aggregate and deliver only the oversize to the secondary. Vibrating scalping screens for this class of service are very satisfactory.

Manufactured Sand

Sand may be produced either by direct grinding, attrition grinding or by impact grinding. The most important elements to be met in a sand manufacturing process are sizes of the particles, gradation, shape and cleanliness. These factors dictate special precautions in the selection of sand-making machinery, of which the following types of equipment are available:

1. Hammermill, consisting of a high speed rotating armature with suspended hammers which repeatedly strike the rock and throw it against breaker

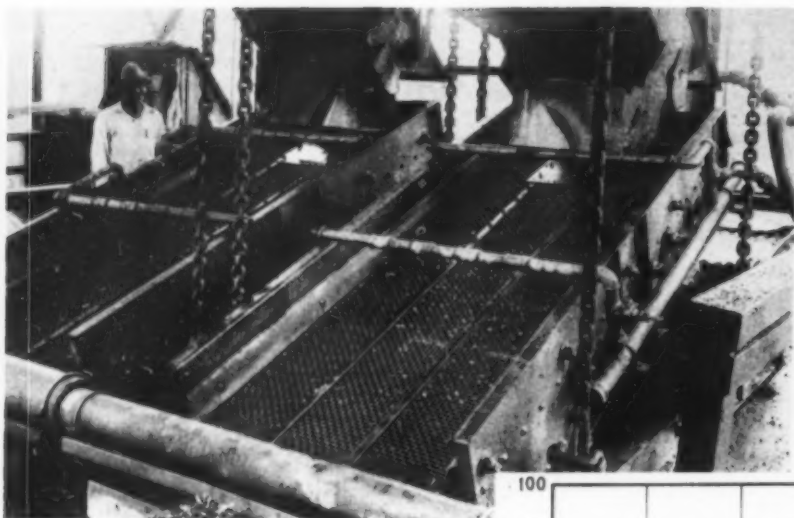


CROSS-SECTION of Newhouse secondary crusher. This type of crusher is designed for suspension from building framework.

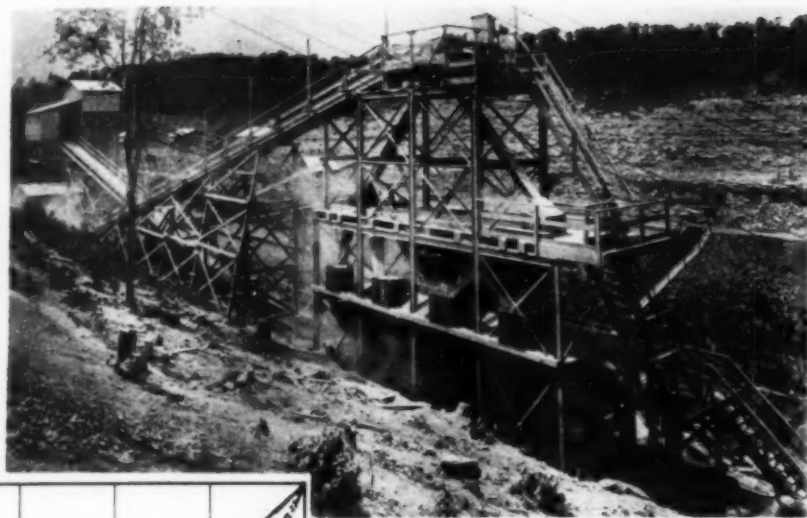
Table of Standard Rock Crushers

FOR COARSE AND INTERMEDIATE SIZES OF PRODUCT

Type	Mfg's Rating Size or Type	Size of Inlet Opening, Inches	Discharge Opening, Fine & Coarse, Inches	Cap. Fine @ Coarse Tons/hour	Req. Hp.	Approx. Net Wt. of Crusher, Lb.
Gyratory (Coarse)	30	30x90	4-6 1/2	235-450	175	169,000
	36	36x126	5-6 1/2	365-525	225	263,000
	42	42x142	5 1/2-6 1/2	475-615	275	286,000
	50	50x162	6-7 1/2	745-845	300	575,000
	54	54x162	6 1/2-8	875-1050	300	630,000
	60	60x174	6 1/2-10	990-1440	300	725,000
Jaw (Coarse)	See Next Col.	30x36	5-7	90-125	72	74,500
		30x48	5-7	120-225	112	121,500
		36x42	5-8	108-235	105	113,000
		42x48	6-10	150-320	134	173,000
		48x60	6-9	175-290	190	221,000
		60x84	7-10	285-450	246	456,000
Gyratory (Intermediate)	6	6x40	1/2-1 1/2	24-69	75	33,500
	10	10x52	1 1/2-2 1/2	100-214	150	67,000
	18	18x68	1 1/2-4	310-735	200	187,000
Symons Cone (Intermediate)	24	3	1/2-1 1/2	25-60	30	10,500
	36	4 1/2	1/2-2	40-95	60	21,000
	48	6 1/2	1/2-2	80-185	100	35,000
	66	9 1/2	3/4-2 1/2	160-450	200	85,000
	84	14	3/4-2 1/2	330-900	300	130,000
Short Head Cone (Intermediate)	36	2 1/2	1/2-1 1/2	15-50	75	22,500
	48	3 1/2	1/2-1 1/2	20-100	150	45,000
	66	4 1/2	3/16-1 1/2	65-175	200	88,000
	74	5 1/2	3/16-1 1/2	120-300	300	143,000
Gyrosphere (Intermediate)	24	3	3/4-1 1/2	20-40	30	9,100
	36	4 1/2	1 1/2-1 1/2	50-120	75	21,500
	48	7	3/4-1 1/2	100-200	125	36,000
Newhouse (Intermediate)	5	5	1/2-1 1/2	15-72	40	14,000
	7	7	3/4-2	34-140	75	24,000
	10	10	1/2-2 1/2	54-260	125	49,000
	14	14	1/2-3	110-530	250	120,000



VIBRATING SCREEN suspended overhead and equipped with water spray nozzles.



SCREENING PLANT structure for separating out acceptable sizes of sand and returning balance for recrushing to hammermill crushing plant shown in background.

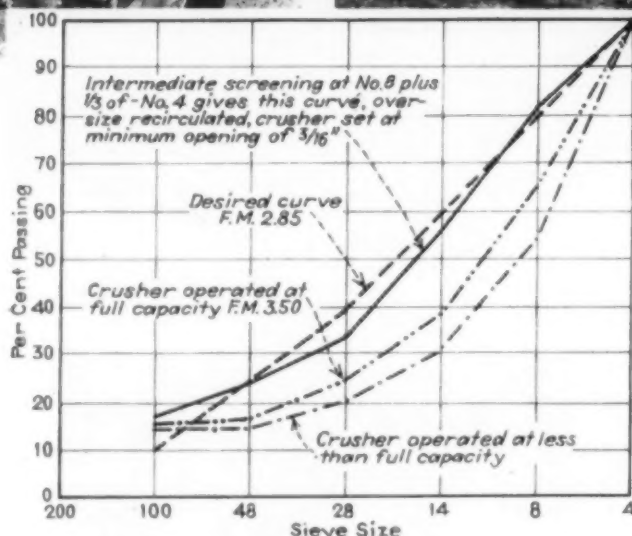
made clear in one of the illustrations which shows two types of products obtained under different conditions of grinding, and a modified product which coincides more nearly with an ideal gradation curve. This product is obtained by screening out some of the intermediate sizes and returning them for further grinding. This method is called adjustment of gradation by selective screening and by regrinding of undesirable sizes and oversizes. Sometimes the circulating feed for such regrinding may be up to 200 per cent of the new feed entering the plant.

From the standpoint of particle shape and its effect on the workability of concrete the hammermill product was found most satisfactory. In comparison with the product from the gyratory crusher, from 4 to 5 per cent less cement was required to obtain the same workability. This great potential saving of cement on a large project justified the selection of somewhat more expensive grinding methods.

The following is a summary of the principal features of the Norris dam sand plant:

2 Allis-Chalmers Pulverizers 42 in. grate bar circle diameter by 48-in. effective length, direct-connected to 250-hp.

slip-ring, 880 r.p.m. induction motors. Type of hammers: Stirrup. Grate bar spacing: 1 1/4 in. 2 Pennsylvania SXR-100 Thor Ajax hammermills. Hammer circle 42 x 47 in. effective length, direct-connected to 250-hp., slip-ring, 880 r.p.m. induction motors. Adapted for stirrup-type hammers. Grate bar spacing, 2 in. Lower breaker plate and grate bars: adjustable.



GRADATION CURVES for dolomite sand produced by 3-ft. short head cone crusher, showing effect of intermediate screening.

Sieve analysis shows effect of varying load on crusher. Product through No. 4 screen, oversize material recirculated, crusher set at minimum opening of 3/16 in. New feed is product from small jaw crusher, mostly -3-in. to +3/4-in. stone.

Size of feed: Passing 3-in. square hole. Size of usable product: Passing 1/4-in. Operation: In closed circuit with double deck. Screens: 1/4-in. opening top deck, 0.093-in. opening lower deck. All stone retained on upper deck returned as circulating load together with approximately 40 per cent of stone retained on lower deck. Recirculating load amounted to 25-100 per cent of new feed.

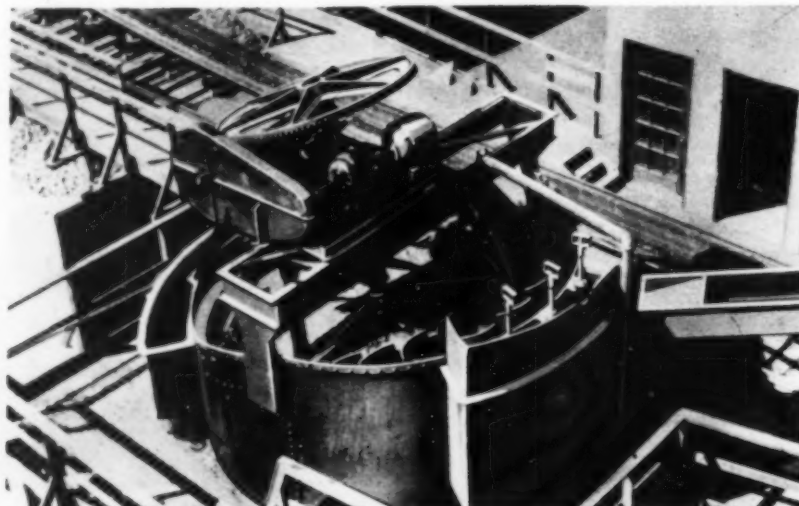
Total tonnage handled, 852,000. Average output in tons per hour, 121. Average motor load, hp., 200. Tons per hp.-hr., 0.314. Tons per hammermill-hr., 60.2. Hammer costs, cents per ton, 2.1. Hammer metal consumption, wear and discard, lb. per ton, 0.126. Average weight per hammer (new) lb., 28.6. Average weight per hammer (used) lb., 18.0. Output of Sand Plant: Coarse sand -1/4 in. to +No. 8, 26%. Fine sand -No. 8 (originally split at No. 10), 58%. Waste, 16%. Cost of rock fed to sand plant, 0.51. Cost of sand produced, \$1.02.

Screening of Aggregates

Sometimes very serious mistakes are made by specifying the tolerances for screening operations in such a way that no equipment can meet them. Where no tolerances are permitted and it is expected that no oversize or undersize will appear in a particular grade, this is, of course, unreasonable. It is considered acceptable, for example, in producing a 3/4 to 1 1/2-in. grade, to require not more than 5 or 10 per cent to be retained on the larger screen size, and not less than 85 or 90 per cent to be retained on the lower screen



MAGNETIC VIBRATING FEEDERS installed in tunnel under storage pile to provide uniform feed of aggregate to belt conveyor. Note interior of tunnel formed by segments of timber, first introduced at Grand Coulee dam.



SAND-WASHING MACHINE or classifier of the rotary type.

size, or an overall tolerance of 20 per cent.

It is not important that the different sizes of sand or gravel be split exactly on the specified sizes of screen as long as their composition is consistent so that, upon recombining, there is obtained an acceptable gradation that will produce first-class concrete with a minimum of cement. Experience has shown that the larger sizes of stone within a grade are less likely to pass through the screen, thus tending to make the various grades deficient in top sizes. For example, at Norris dam separations were desired at 6, 3, 1½, ¾ in. and No. 4, and screens having these openings were initially installed. However, experience showed that the desired separations of aggregate could be obtained more satisfactorily by changing the screens to the following sizes: 7¼, 3½, 1⅞, ⅞, and ¾ in.

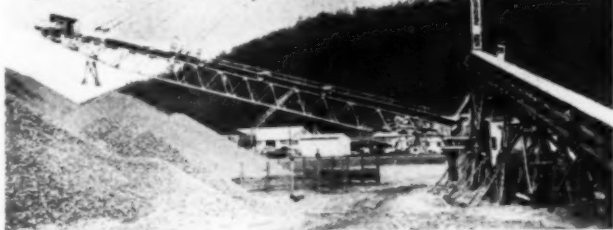


HORIZONTAL SCREENING PLANT system at Norris dam, with storage piles arranged in line and sizing screens located overhead. Reclaiming tunnel is located under full length of storage pile.

cloth, reduced accessibility and low efficiency of the bottom deck. The mechanism for making quick and secure screen cloth replacements and adjustments in screen tension is of great importance on any vibrating screen.

Screen cloth is obtainable either as woven wire, bar screen or punched plate. For ¼, ⅜, or ½ in., a screen with elongated openings is sometimes used and will handle about double the capacity of square openings. When purchasing screen cloth, it is important to specify the size of openings rather than the number of meshes per inch, because the diameter of the wire may vary considerably. As a rule, a heavy wire is desirable for longer life although this reduces the effective open area. It should be kept in mind that No. 4 screen, the division point between sand and gravel, which is commonly considered ¼-in. size, has a standard di-

RADIAL STACKER boom at Guntersville dam supported by guy derrick mast for storing aggregates. Boom carries reversible belt and aggregates can be loaded into far end of boom for delivery to mixers.



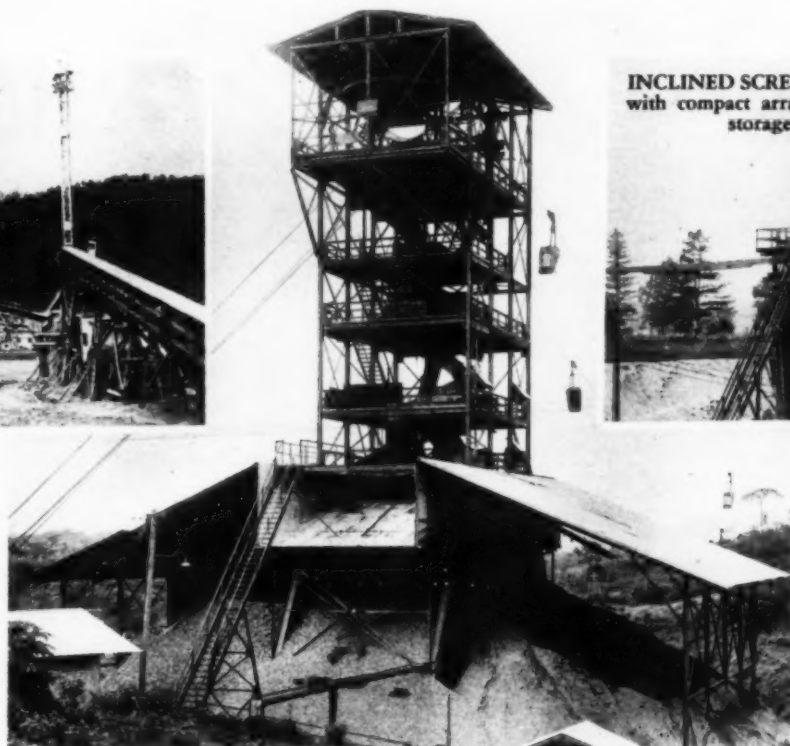
Four sizes of stone and two sizes of sand were produced at Norris dam in the following average proportions, these being controlled by the characteristic fracture of the rock and the required design of the concrete mix: Cobbles, 17 per cent; coarse rock, 12 per cent; medium rock, 14 per cent; fine rock, 15 per cent; sand, coarse and fine, 35.5 per cent; miscellaneous and loss, 6.5 per cent—Total, 100 per cent.

Screens

The revolving screen is one of the simplest types and usually has relatively long life. However, it is more suitable for smaller installations or in connection with large natural gravel pit operations where the scalping out of large boulders is involved. Revolving screens for sizing have limitations because the large particles roll ahead, thus blocking the opening for the passing sizes, the material must be lifted high, which requires extra power, and a relatively small portion of the screen area is in contact with the rock at a given time. Heavy-duty vibrating screens have now been developed for rock sizes up to 6 and 8 in. which, as a rule, are superior in operation and in screening efficiency.

Vibrating screens are obtainable in various types which are roughly classified as follows:

1. Shaker screens which have a relatively low amplitude of vibration and are of little use in rock processing plants.



VERTICAL TYPE SCREENING PLANT structure at Madden dam, with raw aggregates arriving at top over aerial tramway and dropping through various sizing screens to storage piles directly below. Timber-lined walls separate different sizes. Aggregate is drawn off through tunnels located under storage pile.

2. Electro-magnetic screens for sand in which the screen cloth is flexed.

3. Electro-magnetic screens with vibrating frames for sand and small stone.

4. Positive-throw eccentric vibrating screens mounted on springs. This type is most common and can readily handle large aggregate up to 6 and 8 in. Vibration is obtained by driving an eccentric cam which is sometimes supplemented by the rotation of unbalanced weights.

Most vibrating screens are set at an angle to develop gravity flow of the material. Installations should provide for making field adjustments on the slope, throw of the eccentric and on the direction of rotation either with or against the flow of the material. More recently horizontal screens have been

developed with a forward vibratory motion which are very effective and efficient.

There is considerable variation of standard design among different screen manufacturers. In general the capacity of screens runs in approximately the following range:

Size of Screen	Tons per Hour per Sq. Ft. of Screen Area
No. 14	½ to 1
No. 4	2 to 3
½-in.	4 to 6
¾-in.	4 to 6
1½-in.	5 to 7

Double-deck screens are used rather commonly. In some special cases triple-deck screens have been used satisfactorily. They are, however, less suitable for large crushing plants because of the greater difficulty in replacing screen

INCLINED SCREENING SYSTEM with compact arrangement of steel storage tanks.

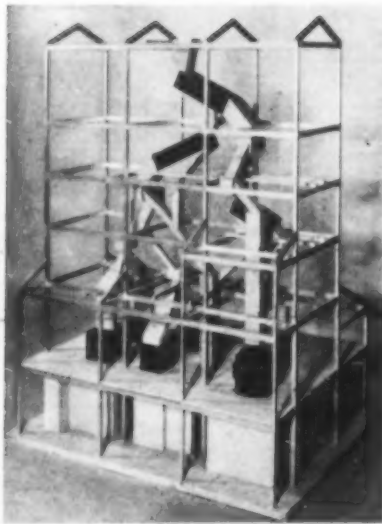


mension of 0.185 in. in the Tyler series.

There is a great variation in quality of screen cloth as indicated by experience at Norris dam where one ⅜-in. screen costing \$12.10 passed 29,000 tons; a ¼-in. screen costing \$17.30 passed 137,000 tons; and a ⅛-in. screen costing \$17.40 passed 31,000 tons.

For ⅜-in. or smaller sizes wet screening is usually much more efficient and is almost necessary in any case where the fines contain enough moisture otherwise to plug the screen cloth. However, precautions should be taken in deciding on wet screening, particularly in sand-manufacturing plants because it may result in very much greater wear of crusher parts. Furthermore, wet screening may overload the classifiers, due to excess water, or make the control of the water cement ratio in the concrete mix more difficult. Wet screening also introduces freezing trouble.

A matter which is usually not given enough consideration in design of screening plants relates to proper arrangement of chutes. It may be a primary problem, rather than a mere detail to arrange the chutes so that maintenance on them is reduced to a minimum. Manganese liners and rubber liners are helpful, but wherever possible pockets should be provided which retain some of the stone or gravel to absorb the impact of the



MODEL of screening plant at Hiwassee dam built to study relative positions of crushing and screening equipment and layout of chutes to reduce number of wearing points and provide most direct travel for aggregates.



AIRPLANE TYPE of traveling stacker used to build up two long storage piles at Grand Coulee dam. Reclaiming tunnels are located under each pile.

falling material. As an indication of the problem it is easy to calculate that in a screening plant which is designed to produce 2,000,000 tons of aggregates a gravity fall of 50 ft. from screen to screen and through chutes down to hammermills or other processing equipment results in the generation of 100,000 hp.-hr. of energy, and this energy is absorbed primarily in wear of equipment, chutes or chute liners, in breakage of material due to impact on itself, and in noise and vibration.

Washing of Aggregates

For primary washing of aggregate up to 6 or 8 in. in size, and containing considerable clay, special scrubbers are used. These are large revolving cylinders with vanes and paddles which lift and tumble the gravel over itself in a bath of water. Another type for washing stone and gravel is the log washer which operates like a screw washer does for sand. Further effective means of washing the aggregates as they go through a screening plant may be obtained by directing sprays or jets of water on the aggregate as it flows over the screens. An important point here is that high pressure is less effective in washing the aggregate as compared with greater volume at lower pressure.

There are various types of sand-

washing equipment available including the following: Drags of the reciprocating type or with a continuous chain; hydraulic vortex classifiers; rotating vane classifiers; dewatering scoops; and cone settling tanks. Settling tanks and drags have capacities up to 24 and 48 tons per hour, and use from 550 to 1,150 gal. of water per minute. The water required for washing a ton of sand per hour is approximately 10-20 g.p.m.

In some cases there is danger of washing out too many fines, particularly in the sizes between No. 50 to 100 mesh, and also in the 100- to 200-mesh, a size which is of considerable importance in making good concrete. At Norris dam a substantial saving was obtained by collecting in a cone reclaimer a large part of the fines which were washed out of the sand classifier;

a large dam is the storage of aggregate in sufficient quantity to meet effectively the demand of the concrete mixing and placing equipment. Some of the most characteristic types of storage are shown in an accompanying illustration. The vertical system of screening and storing directly below the screening plant was used at Madden dam. This had a capacity of 18,000 cu.yd., of which 6,000 yd. was live storage. The horizontal screening plant layout as used at Norris dam provided storage piles under the screening structure which contained 65,000 tons of gross storage; 16,000 tons of this was live storage.

At Pickwick Landing dam the Kern circular storage system, with a capacity of 300,000 tons, proved effective and economical because the aggregates were produced under contract by a large and expensive floating dredge and barge transporting plant. By storing the aggregate as fast as the dredge could produce it, instead of limiting production to the rate required by the mixing plant, the cost of the aggregate was reduced sufficiently to pay for the entire storage system. At the same time once the aggregate was in storage it was always available for concreting, and this eliminated possible shutdowns of the concrete plant due to delays in the gravel production plant.

A modification of the circular storage was employed at Guntersville dam where aggregates were produced from the river bed by a suction dredge and delivered to the dam in barges. The problem here was to store up to

at Grand Coulee dam to build up two long and very large storage piles having a total capacity of 148,000 tons, of which 77,000 tons were live storage. Reclaiming tunnels under each pile were equipped with gates and belt conveyors by which the aggregate was drawn off and delivered to the mixing plant. At Bonneville dam aggregate was stored in timber silos which were octagonal in shape, 30 ft. inside diameter by 57 ft. high, and contained 1,600 cu.yd. in each silo. They were built up by stacking 6-in. thick timbers, which were 16 in. wide at the base of the silo and varied to 10-in. widths at the top. Another aggregate system of considerable interest was used at Fort Peck dam where the screening plant itself traveled along in the borrow pit and loaded the final product directly into long strings of railroad cars which, in effect, were the storage element. The rejected materials, consisting of oversize and undersize, were in this case loaded back into the abandoned section of the borrow pit.

In designing storage systems, adequate means, such as rock ladders, should be provided to minimize breakage and segregation. Drainage is a major item, particularly in the storage of sand. A constant moisture content offers the simplest means of maintaining proper control over the concrete mix. In some cases special roofs of timber, sheet metal or canvas are desirable to protect against rain and to keep it from accumulating in the craters above the reclaiming tunnel.

Reclaiming tunnels are sometimes a major item of expense. Concrete tun-



LARGE-CAPACITY CIRCULAR STORING SYSTEM at Pickwick Landing dam, with aggregates delivered to central tower and drawn out radially with drag scraper operated from traveling tower. Reversing of drag scraper feeds aggregates to central reclaiming tower.

these were recombined with the sand being processed. The use of this sand containing a higher percentage of fines resulted in a reduction of cement requirements in the concrete, as well as utilizing more of the processed materials which had the same value per ton as sand. In nine months the total gross saving was \$42,000, or \$35,000 net.

Another problem in collecting fines relates to the handling of dust, particularly where a high silica content may expose the workers in the plant to silicosis. An effective dust collecting system under such conditions is of utmost importance.

Storage of Aggregates

An important element of a plant for

215,000 tons of aggregate which were delivered to storage at a greater rate than needed for concreting. For this purpose, a novel layout was devised which consisted of a central tower and guy derrick mast which supported a long stacker boom. This boom could be rotated and elevated by a derrick hoist and it could be spotted over the various piles of sized aggregate for delivering aggregates to storage. A conveyor ran from the base of the boom to the mixing plant to deliver aggregates direct from barges, or, from storage by loading into a hopper at the tip of the boom and reversing the boom conveyor belt.

An airplane type of stacker was used

nels are particularly expensive. At Grand Coulee dam a laminated timber tunnel was developed and used with considerable success. The roof was arched and made up of eight or nine pre-cut pieces of 4x10-in. lumber, cut and drilled for spiking at the mill. Such a tunnel costs about \$16 per lineal foot for lumber and erection, which is about half the cost of a concrete tunnel.

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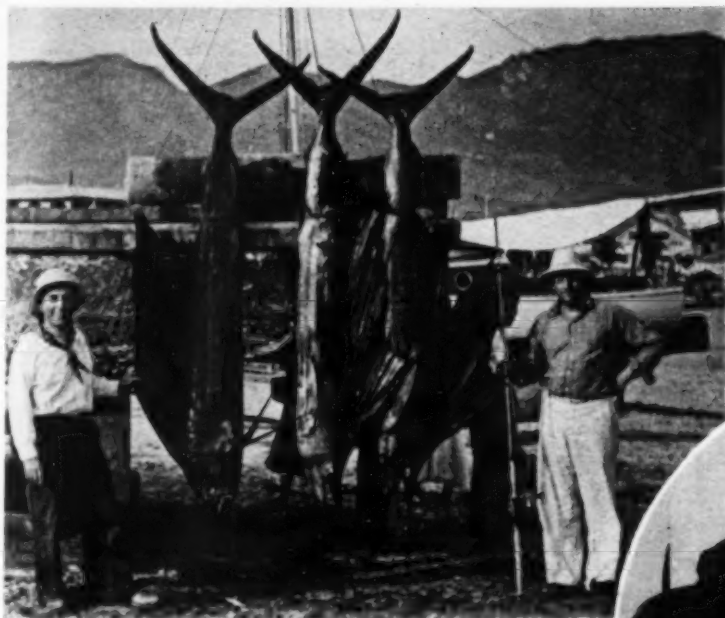
NEXT MONTH — Chapter 21 of the series on "Heavy Construction," by A. J. Ackerman and C. H. Locher, to appear in the September issue, will discuss "Cement Handling and Concrete Mixing."

Present and Accounted For~ A PAGE OF Personalities



"GREAT GUY"

That's the way they refer, out on Colorado River Aqueduct in California, to BEN ARP, hard rock tunnel man and general superintendent for Utah Construction Co., contractor for Iron Mountain tunnel and sections of open cut canal and conduit being built under supervision of Metropolitan Water District of Southern California.



ANGLING PROWESS

of W. A. KLINGER (right) president of Associated General Contractors of America, and E. P. FORRESTEL, road-building contractor of Akron, N. Y., is attested by this catch of three big sailfish, ranging in weight from 108 to 124 lb. Length of largest fish, from tip of nose to tip of tail, was almost 13 ft. Fish were caught in Pacific Ocean 12 mi. south of Acapulco, Mexico. "See if you can produce any construction men," challenges Mr. Klinger, "who have caught any larger sailfish than these."



FORT PECK DAM BUILDERS

assembled at temporary headquarters of U. S. District Engineer Office at right end of Missouri River bridge prior to closure operations at Fort Peck dam, in Montana, June 23-26, (as described elsewhere in this issue) are, left to right: W. R. Minton and C. C. Ferguson, both of Great Northern Railway; Capt. R. Lee, Corps of Engineers; A. G. Davis, associate engineer; Lieut. Col. T. B. Larkin, district engineer in charge of Fort Peck dam, (recently transferred to War College, Washington, D. C.); Major Clark Kittrell, Corps of Engineers, (newly appointed district engineer, succeeding Col. Larkin); and T. F. Dixon, superintendent, Butte Division, Great Northern Railway.



MARINE PARKWAY BRIDGE

across Rockaway Inlet, between Brooklyn and Jacob Riis Park, New York City, opened to traffic July 3, was erected by American Bridge Co. with E. E. McKEEN (left), resident engineer, and D. M. WOOD, superintendent, in charge of field operations. Methods of erecting main lift span and two side spans on tall steel falsework on car floats and then floating them into place was illustrated and described in CONSTRUCTION Methods and Equipment, May, 1937, pp. 56-57.



HEADS CEMENT ASSOCIATION

FRANK T. SHEETS, formerly consulting engineer and director of development, has been promoted to office of president of Portland Cement Association (effective Sept. 1), succeeding E. J. Mehren, who resigned to take care of his personal interests. Mr. Sheets was associated with Illinois Highway Department for 23 years, of which 12 years were spent as superintendent of highways and chief engineer. He is a past-president of American Association of State Highway Officials and of Central Illinois section of American Society of Civil Engineers.



NEW CHIEF

of Pennsylvania Highway Department is SAMUEL W. MARSHALL (left), succeeding H. H. Temple. Mr. Marshall comes to his new post, as state highway engineer, from Pennsylvania Turnpike Commission, to which he had recently been appointed by Governor Earle.



BLAST (left) at 4:20 a.m., June 24, removes earth levee at upper portals of diversion tunnels, allowing river to flow into tunnels.

River Diversion Completed at Fort Peck Dam

THE MOST IMPORTANT EVENT, from an engineering standpoint, of the whole five-year construction program of the U. S. Army Engineers at Ft. Peck dam on the Missouri River in Montana, occurred at 4:20 a.m., Thursday, June 24, when a small earth dike, the last remaining barrier keeping Missouri River water from entering the four diversion and control tunnels, was cut by blasting. The diversion tunnels have been under construction since June, 1934, and were completed only a few hours before they were put to use carrying the Missouri River away from its ancient course.

Train loads of coarse gravel were being accumulated at the same time in preparation for the final closure at the railroad bridge crossing the river along the line of the downstream toe which marks the lower edge of the huge hydraulic earth fill. Glacial boulders were dumped on either side of the river and placed as a sill for the

gravel. This placing was accomplished by means of bulldozers and a derrick boat.

At 4:51 p.m. the Army Engineers started their final drive to close off completely all flow under the bridge. At 7:05 p.m. the load was dumped which accomplished this objective. During this 134-min. period exactly 140 carloads of heavy material were dumped into the channel — less than a minute per car. The 140 cars meant four trains of 35 cars each, pushed up the ramp leading on to the bridge. Dumping in the narrow river channel meant that only two or three cars at a time could be spotted for dumping.

During the day, a total of 298 railroad cars containing 11,470 cu.yd. of rock and gravel were unloaded, bringing the top of the material well above the surface of the water in the river channel. Flow was definitely and effectively stopped through the dam and the Missouri was forced through the diversion tunnels.

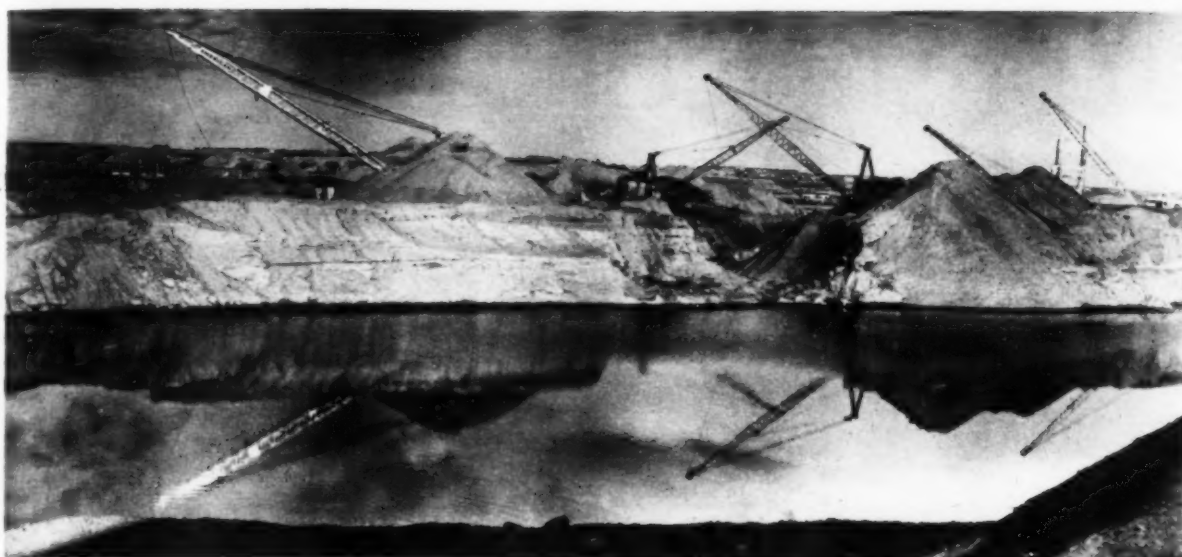


INLET PORTALS to diversion tunnels shortly after closure of dam had been completed and flow of Missouri River diverted.



OUTLET CHANNEL from diversion tunnels as break was made allowing water to return to river channel below dam. Dredge "Gallatin" in background digging from river side, 7 a.m., June 24.

River at the damsite was low, having fallen as low as 5,000 sec.-ft. A flash rise in the river on June 13-14, of more than 12 ft., caused by heavy rainfall over practically the whole watershed area above the dam, resulted in flow reaching 48,000 sec.-ft. From this peak flow, the river subsided rapidly to a flow of approximately 9,000 sec.-ft. on June 23. Rapid drainage of the sand fill along the river caused a portion of it to slide toward the open river channel section at a point near the steel railroad bridge. This movement of the fill threw a heavy load against the east concrete pier of the bridge, pushing it out of line and opening up a large crack. The main



OUTLET PLUG is scene of busy excavation operations by draglines at 5 a.m., June 24.

bridge span and the railroad line were in danger.

Realizing that immediate action was called for in this emergency, the Army Engineers decided to forestall further complications at the bridge by making closure at that point where every carload of gravel would serve two vital purposes — add stability to the structure and choke off the river channel. This was done, and operations in accordance with quickly revised plans

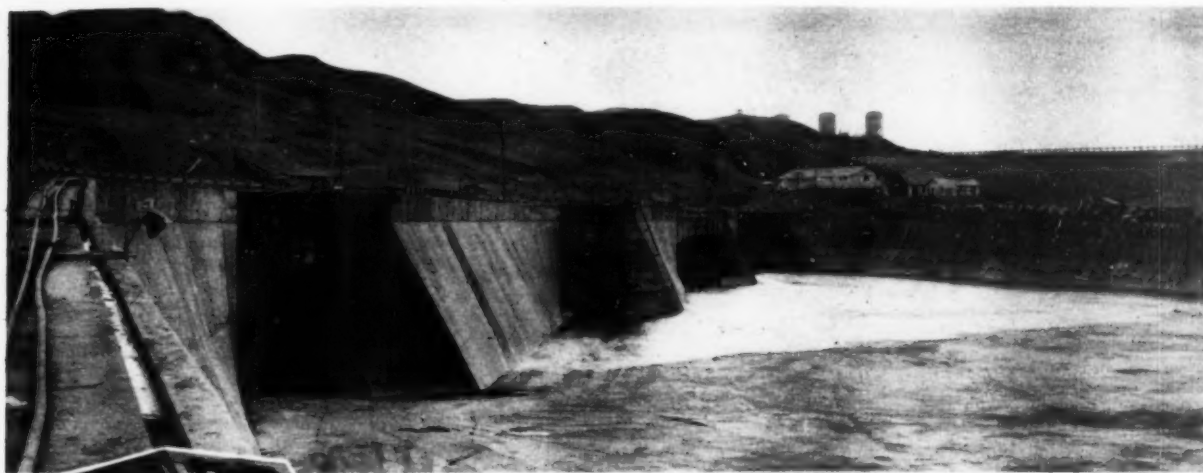
proceeded with clock-like precision.

With closure made at the downstream toe, there still remained the job of making a second closure at the upstream toe. To do that required that heavy trains of gravel and rock be split up for the trip around the dam by way of the spillway. Starting about midnight Saturday, gravel trains arriving from Wiotra were split and about two-thirds of the loads were used for the upstream closure. Approximately 200

carloads were required to bring material above the water surface making a closed pond in the middle of the dam. Closure at the upstream trestle was effected at 1:00 a.m., Monday, June 28th, with the upstream gravel toe section across the river channel scheduled for completion by June 30.

While gravel and rock dumping was in progress three dredges were pumping fill into the four corners of the roughly rectangular channel section of the dam. By Sunday, enough solid fill was in place inside both toes to carry crawler dragline earth movers without the use of "mats" or wooden platforms to keep them from being bogged down as they placed clay blankets on the faces of the gravel piles. All four dredges are now in operation and it is estimated that, since closure, more than 600,000 cu.yd. of hydraulic fill have been pumped into the channel area.

The four new pump barges recently constructed to dispose of core pool water have taken their positions near the axis of the dam and are discharging pool water into the channel above the dam. Tractors, draglines and crews of workmen are busy tearing out the two wooden effluent spillways near the cut-off wall since these are now useless. The pump barges have replaced that method of getting rid of water from the core pools. Driving of steel sheet-piling to raise the cut-off wall 20 ft.



FIRST FLOW (above) of Missouri River water issues from outlet portals of diversion tunnels at 4:50 a.m., June 24. Note that flow from tunnel No. 4, the longest (at left) has not yet started.

CLOSURE (left) of channel, through damsite is made on afternoon of June 25 by dumping rock and gravel from railway cars on steel bridge. During day 298 cars containing 11,470 cu.yd. of material were unloaded.

above the bed of the river is proceeding from the right bank.

The present situation reveals: The diversion and control tunnels carrying the Missouri River; gravel toes along the edges of the great earth-fill barrier nearing completion; all dredges, boosters and other floating plant below the dam and set to close the gap in the dam and level it off as one continuous structure by the end of the season.

A message of congratulation and commendation on the successful completion of closure operations at Fort Peck dam was sent by Major-General Edward M. Markham, Chief of Engineers, U. S. Army, and transmitted to the engineering and construction personnel on the project by Lieut.-Col. Thomas B. Larkin, District Engineer in charge at Fort Peck.

Construction Equipment News

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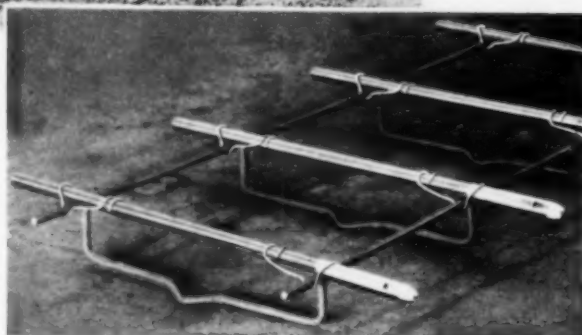
Review of Construction Machinery and Materials for August, 1937



PRE-BUILT ROOF SYSTEM of hollow burned clay units, (inset) assembled, cemented and bolted together and supplied to job in form of complete roof sections ready to lay in place on roof frame. Hollow design of units, combined with cellularity of clay structure after special manufacturing process and burning at temperature of 2,000 deg. F., results in product light in weight, strong and rigid, and of high insulation value. When assembled and bolted together according to length of span required they are easily set in place at low cost without use of formwork. Recommended span of 8 ft. may be designed for safe total loads up to 66 lb. per square foot. Tile weight is 13 lb. per square foot. For shorter spans safe total loads can be greatly increased. Overhangs and drip boards at eaves readily taken care of. Tongue-and-groove feature provides interlock for adjacent roof sections which are tightly sealed when grout filler is applied. Natco Dek-Tile roof is fireproof and insulated, free from condensation and likelihood of moisture drips, impervious to acid fumes and will not flake off or disintegrate. — **National Fireproofing Corp., Pittsburgh, Pa.**

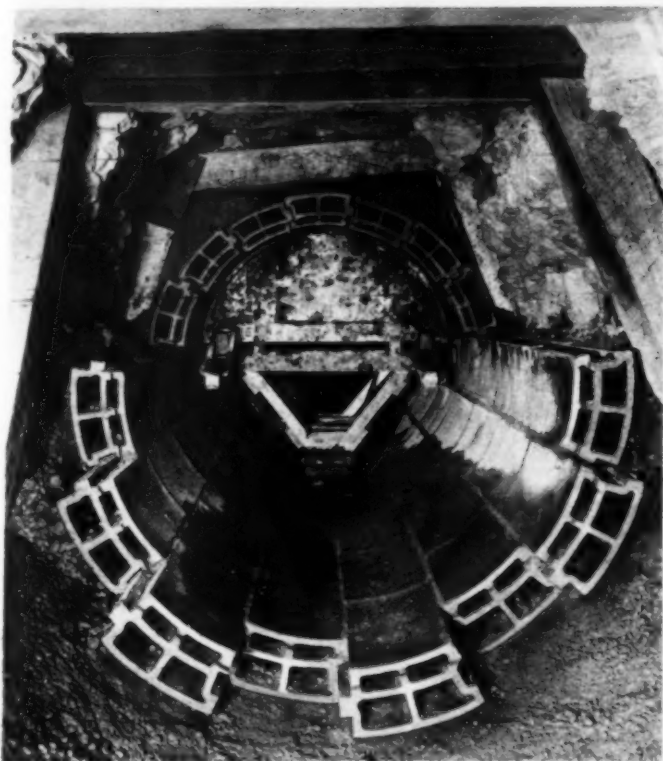


WELDED DOWEL ASSEMBLY UNIT of rigid construction enables contractor to assemble dowels, joint and expansion sleeves prior to placing. Each support is welded to two distribution bars to space accurately each dowel held in place by spring bar ties. Movement of concrete slabs provided for by V formed in center of bottom support rod. Complete assembly (right) utilizes expansion tubes or metal sleeves which fit over ends of dowel bars providing space for bars to move as concrete slab expands and contracts and bar ties which lock reinforcing bars securely in place at intersections. — **Truscon Steel Co., Youngstown, Ohio.**



CLAY DIGGERS in two models, one light and powerful for ordinary tunnel work and other for caisson, large tunnel and demolition operations have outstanding feature called "Pigtail" rubber bumper which fits around shank of spade as well as inside retainer forming effective packing that prevents dirt or gravel from entering. No lock collar is used, handle and barrel being clamped together with two bolts. New type retainer, with lock, is used and is not affected by dirt or gravel. With ball end butts both machines can be used for vibrating concrete in forms by tamping wood or steel forms. — **Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill.**





SINGLE-RING SEGMENT BLOCK for sewer construction are made of specially selected Ohio shales by process which includes improved de-airing method and insures maximum density and minimum absorption, providing highly-glazed vitrified product impervious to water, decomposition or deterioration under chemical action. Advantages claimed: (1) low absorption giving greater structural strength; (2) low maintenance, material and labor costs; (3) less excavation—trench only slightly wider than outside diameter of sewer; (4) ease of installation—no costly hoisting equipment—unskilled labor; (5) minimum inspection costs; (6) flexibility—design of block permits construction of all conventional forms of sewers. Templets and forms furnished for each installation of single-ring segment block.—**Robinson Clay Product Co., Empire State Bldg., New York City.**



SAFETY NON-SPARKING WRENCH. drop forged from beryllium copper is designed for use in locations where spark caused by metal-to-metal contact would be dangerous. Non-magnetic and non-corrosive. Made in wide range of sizes in both single and double-head patterns.—**J. H. Williams & Co., 75 Spring St., New York City.**



PRESSURE DISTRIBUTOR. 1937 model, offers following improvements: (1) Use of special suction fittings on manifold bar and spray bars prevents entrance of air through nozzles from breaking suction until lines are emptied, getting rid of dripping after spray is cut off; (2) specially designed hood over spray bars shields operator and pumping engine from dust; (3) streamlined rear wheel fenders protect operator and machine from bitumen, dust and chips; (4) spray bar now rises, giving ample road clearance between shots; (5) dust caps seal spray bar feed line against dust and stones while spray bars are removed, preventing nozzles from clogging; (6) two-way signal system between operator and driver. Basic features of Model C—single valve, crosswise mounting of pumping engine to cut down overhang, use of rock wool insulation, heat chamber for quick thawing of pump, valve and lines, 16x4-in. pneumatic-tired fifth wheel tachometer drive and pump tachometer have been retained.—**Littleford Bros., 465 E. Pearl St., Cincinnati, Ohio.**



CABLE-OPERATED TRAILBUILDER for all popular size track-type tractors embodies patented action that permits unusual speed in tilting blade for casting to either side. Design prevents any load reaction on tractor's main frame or springs. Moldboard of size and contour for maximum pay load. Photo shows Trailbuilder mounted on Cletrac tractor building roads and cutting down grades on mine property where ground was frozen from 14 to 32 in. in depth.—**Emsco Derrick & Equipment Co., Tractor Equipment Division, 332 S. Michigan Ave., Chicago, Ill.**

SHOCKLESS ELECTRIC HAMMER (right) incorporates small auto-transformer in control box which permits operation from common 110- or 220-v. a.c. lighting current while hammer itself operates on transformed low voltage. Major advantage is safety feature in handling low voltage portable electric tool, particularly on ladders, scaffolds and other dangerous places. Used for scaling paint and rust from metal, for drilling holes in concrete, cutting openings in masonry walls and in other maintenance and construction work. Weight, 16 lb. Each hammer supplied complete with 15-ft. rubber covered cable, small portable controller, two star drill chucks, drift pin, can of oil and 10-ft. extension cord, all packed in durable carrying case.—**Syntro Co., 400 N. Lexington Ave., Pittsburgh, Pa.**

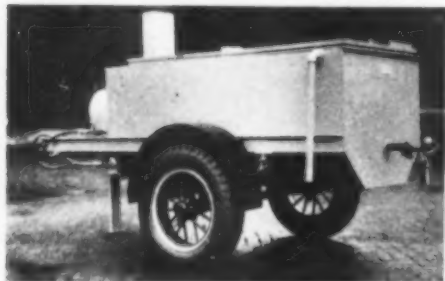


Further Information

Requests for further information should be sent to:

The Editor,
CONSTRUCTION
Methods and Equipment
330 West 42nd Street
New York, N. Y.

Construction Equipment News (Continued)



LIGHT-WEIGHT ASPHALT HEATING KETTLE of 300-gal. capacity for use on highway patching jobs has been designed to eliminate all unnecessary weight so that it may be mounted on single pneumatic tires or carried on small light truck. Two other features: double heat circulation and screened reservoir. Overall dimensions 135x70 in.; loading height above ground, 59 in.; Timken roller bearings; weight, 2,250 lb. — **Littleford Bros., 443 East Pearl St., Cincinnati, Ohio.**

5-CU.YD. HYDRAULIC SCRAPER has minimum of dead weight which reduces drawbar pull necessary for capacity loading and hauling to dump by 35-hp. tractor. Hydraulic operation is accomplished by twin cylinders located over side frame members, by pump directly connected to engine transmission of tractor, and by four-way hydraulic valve con-



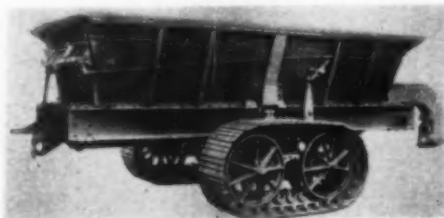
trolled by tractor-driver. Entire weight of scraper is utilized in forcing down cutting edge. Two adjustable stops bolted to upper edge of pan on either side regulate proper opening above cutting edge for particular material to be excavated and maximum depth of cut. To dump, pan is raised to vertical position, endgate latches are released and endgate swings out. Can be backed and dumped over edge of fill, at bridge abutments or into deep depression. Weight, 5,350 lb. — **Baker Mfg. Co., Springfield, Ill.**

FAN-COOLED, SQUIRREL-CAGE MOTOR, dual ventilated, is designed for severe service in cement plants, machine shops and outdoor locations, full protection being assured against abrasive dust,

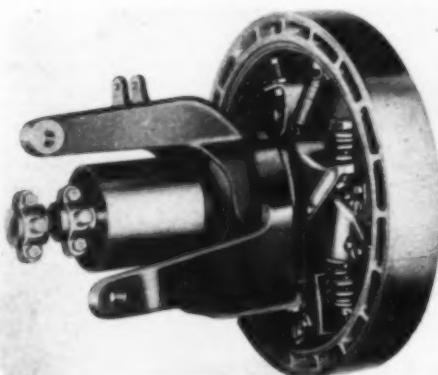


moisture and corrosion. Motor frame contains two separate sets of air ducts—internal and external, former open in interior part of motor and latter outside of motor frame. Heat exchanger principle used for cooling. Internal fan on rotor circulates warm

internal air through internal ducts, walls of which are cooled by external fan blowing larger volumes of cool air through external ducts, providing rapid transfer of heat from motor and insuring long insulation life. Housing so designed that fresh grease automatically cleans used grease from bearing, thus obviating necessity of periodic dismantling of motor. — **Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.**



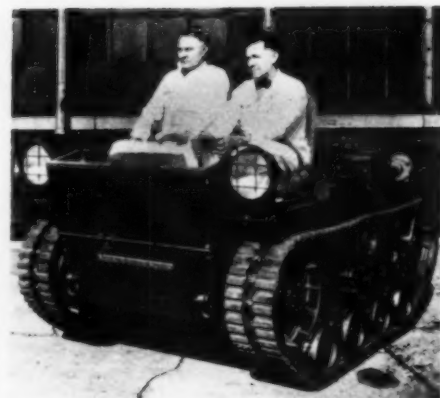
18-YD. BOTTOM-DUMP TRAILER, equipped with 30-ton-capacity wheels, is built to carry capacity loads wherever track-type tractors can operate. Axle and drawbar spring mounted to absorb loading and other shocks. Simple, positive mechanical windup. Rigid construction. — **Athey Truss Wheel Co., 5631 West 65th St., Chicago, Ill.**



MAIN CLUTCH CUSHION in hoist drum on new line of smaller Northwest shovels reduces maximum stresses on all parts under power when hoist rope is tensioned, transmitting full engine power, yet adding materially to life of machine. Makers claim that maximum loads on drum shafts are reduced by 50 per cent and drum clutch adjustments three to five times. When dipper teeth hit immovable rock, operator has longer time to throw out clutch to prevent engine stalling, jolts and jars are minimized, and fast and smooth action results. Working in rough material, life of hoist rope is lengthened by this cushioning action of clutch. — **Northwest Engineering Co., 28 E. Jackson Blvd., Chicago, Ill.**



5-YD. TRACTOR-SCRAPER is recommended by its makers for easy and speedy loading not only on highway jobs, but also on grade separation and bridge approach work, airport and golf course construction, stripping overburden at mines, quarries, gravel and clay pits and various land-leveling operations. Designed for use with tractors within range of 35 to 60 hp. All loading, carrying and dumping controlled by one cable and one lever mounted conveniently for operator. Other advantages: (1) low first cost due to simplicity of design—less cable, single-drum winch; (2) reduced operating cost—one-man operation, minimum fuel consumption, ease and versatility of performance; (3) high yardage; (4) low upkeep—all-welded construction, high pressure fittings, ball bearings, longer cable life. Cuts any depth from 1 to 6 in. Adjustments provided for varying clearance under machine; front door is so constructed that pan will always get full load. Depth of spread up to 9 in. Turning radius of 8½ ft. permits short turns at all times. — **Austin-Western Road Machinery Co., Aurora, Ill.**



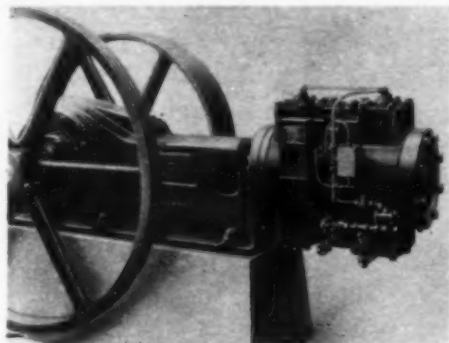
TRACK-LAYING TRACTOR capable of sustaining average road speed of 25 m.p.h. is equipped with new type of rubber track (built by B. F. Goodrich Co.) which is said to make possible smoother operation and greater quietness by elimination of clatter and vibration common to steel tracks. Track consists of continuous band of rubber smooth on inner surface and with traction lugs on outer surface. It is prevented from stretching or losing shape by core of 20 or 30 endless flexible steel wire cables gripped at equal intervals by track guide and drive lugs. Other features: (1) spring suspension for cushioning road shocks; (2) finger-tip steering control; (3) new type steering clutches, fully air-cooled; (4) economy of fuel consumption (estimated—4 or 5 mi. per gallon.) — **Marmen-Herrington Co., Inc., Indianapolis, Ind.**

7-IN. ELECTRIC DISK SANDERS in two models—one for heavy-duty and one for constant production service—are used for removing weld marks, rust or dirt from tanks, for finishing tile, concrete, stone and marble surfaces, for sanding metals, smoothing steel and iron castings, beams and columns. Heavy-



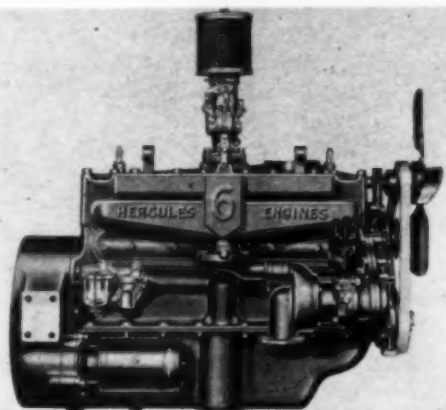
duty model is 16¾ in. long and weighs 12½ lb. Continuous production model is 16¾ in. long and weighs 14 lb. Features: (1) aluminum alloy bodies die cast in streamlined design; (2) comfortable grip handles assuring complete control under heavy sanding loads; (3) air-filter protects commutator and motor from abrasive dust and dirt; (4) straight-line ventilation assures cool running tool; (5) ball bearings, fully sealed against dust and grease leakage; (5) bevel gearing. — **Skilaw, Inc., 3914 Ravenswood Ave., Chicago, Ill.**

MAGNETIC UNLOADER provides automatic start-and-stop control and automatic loading and unloading without additional equipment on Worthington motor-driven single-horizontal compressors without extra piping, valves or other equipment. Operates on standard electric equipment and can be installed



wherever conventional automatic starter is used for controlling compressor motor. Only other provision necessary is pressure switch (for operation of pilot circuit) control of which may be transferred electrically from motor starter to magnetic unloader or vice versa, as desired. When connected to motor starter, compressor starts and stops on demand for air. When connected to magnetic unloader compressor runs continuously and simply loads and unloads, depending upon whether or not air is needed. If desired, cooling water supply also can be automatically controlled. Unit also functions as starting and stopping unloader. — **Worthington Pump & Machinery Corp., Harrison, N. J.**

TWO NEW MODELS have been added to "QX" line of Hercules small six-cylinder heavy-duty engines for use in general industrial and road-building machinery. One model (QXA) has 3 1/8-in. bore, 4 1/8-in. stroke and displacement of 190 cu.in.; other model (QXB) has 3 1/4-in. bore, 4 1/8-in. stroke and



displacement of 205 cu.in. Maximum torque of QXA is 130 lb.-ft. at 1,000 r.p.m. and of QXB is 135 lb.-ft. at 1,000 r.p.m. Maximum speed of both models 3,000 r.p.m., QXA developing 55.5 hp. and QXB 60 hp. at this rate. Features: (1) Water completely surrounds valve seats providing for proper valve cooling during sustained high speeds; (2) full force-feed lubrication to all main and connecting rod bearings; (3) oil pressure readily adjusted to suit operation requirements. — **Hercules Motors Corp., Canton, Ohio.**

BOX CAR LOADER for handling bulk materials with minimum of dust and segregation consists of anti-friction belt conveyor supported on castor-mounted horizontal boom which can be rocked back



and forth or rotated 360 deg. by hand. Conveyor operates at comparatively slow speed and has discharge height of 5 ft. Machine, mounted on four swiveling casters, can be moved in and out of cars by three men. When in position only one man is necessary to operate it. — **Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill.**

News from Manufacturers ABOUT THEIR PRODUCTS

The publications, reviewed below, will keep you posted on latest developments in construction equipment and materials available for your use.

DIESEL TRACTOR — **Caterpillar Tractor Co., Peoria, Ill.** (32 pp., illustrated.) Complete mechanical details of RD7 diesel model rated at 53 hp. Four-cylinder, valve-in-head engine, 5 1/4 x 8-in. bore and stroke; 850 r.p.m. Two gages, 74 and 60 in., center to center of tracks. Starting by independent two-cylinder gasoline engine. Shipping weights 20,980 and 20,320 lb. Diagrams and text explain fuel supply and injection system. Removable cylinder liners. Sealed from dust and mud. Rear power takeoff.

ROAD SOIL STABILIZATION — **Columbia Alkali Corp., Barborton, Ohio.** (16 pp., illustrated.) Use of calcium chloride for controlling dust and stabilizing road soils. Recommended quantities for various intensities of traffic and widths of road. For stabilization purposes samples of soil may be sent for analysis to company's soil testing laboratory.

MULTI-PLATE BRIDGES — **Armco Culvert Manufacturers Association, Middletown, Ohio.** (16 pp., illustrated in color.) Examples of single, twin- and triple-arch bridges and a large pipe structure of Armco ingot iron. Notes on assembly, with wrench, of corrugated plates punched and curved to proper radius for quick field assembly. Spans up to 22 ft. Plates range in thickness up to 9/32-in. and are strengthened by extra large corrugations. For field assembly galvanized bolts, 11/16 in. in diameter are used. Complete design data on multi-plate structures is available on request.

SPECIALIZED PAINTS AND MAINTENANCE PRODUCTS — **Skybrite Co., Cleveland, Ohio.** (12 pp., illustrated.) Acid and alkali-resisting paints in black and aluminum, general purpose aluminum paint, calking compound, casein wall paint, cement paint, concrete floor enamel, glass cleaner and glass coating to prevent glare, roof coating, primer and patching cement, rust solvent. Data on uses and surface coverage per gallon. Full page table is guide to proper selection and application of company's products to wide range of maintenance services.

RECONDITIONING OLD PUMPS — **International Nickel Co., Inc., 67 Wall St., New York, N.Y.** (6 pp. folder, illustrated.) How rust-proof, durable monel metal parts, such as piston rods, shafts, liners, sleeves, valves or impellers, can be used as replacements to eliminate operating difficulties and extend life of old pumps. Other 4-pp. folders on Monel gaskets and valves trimmed with Monel to insure long life.

LIGHT POWER SHOVEL — **Austin-Western Road Machinery Co., Aurora, Ill.** (24 pp., illustrated.) Three-quarter swing, crawler-mounted machine, with dipper capacity (struck measure) of 12 cu.ft. and weight of 22,100 lb. Power unit International gas or diesel tractor. Advantages claimed for three-quarter swing design are lighter swinging weight, greater stability, better visibility and no tail swing. Machine is convertible into crane or dragline. Detailed data on crawlers, frame, power plant, boom hoist, swinging mechanism, crowd, bucket hoist, dipper stick and clutches.



WINDOWS OF ALUMINUM AND BRONZE — **Kawneer Co., Niles, Mich.** (12 pp., illustrated.) Double hung frames, easy to raise and lower. Rustless, watertight and airtight construction. Several standard types of glass divisions. Narrow frame and sash members admit more light. Examples of installations and drawing showing design details.

TRACTORS AND GRADERS — **Caterpillar Tractor Co., Peoria, Ill.** (12 pp., illustrated.) A collection of large size action photographs illustrating applications, in road maintenance, of diesel-operated auto patrol machines, tractors and blade graders. Snow removal equipment, also.

SEEING IS BELIEVING



• This large midwest piling contractor was "from Missouri." He doubted the ability of 11-gauge Union Metal Fluted Steel Pile Shells to stand up under heavy driving without internal mandrel reinforcement.

Recently, at the Cleveland Southerly Sewage Works, he saw sixty-foot 11-gauge Union Metal shells being driven to final penetration with a 5000 lb. Vulcan No. 1 steam hammer. He watched each shell go down — inspected them after driving. At the end of the day he left the job convinced that they were not only the easiest and fastest-driving pile shells he had ever seen, but the toughest.

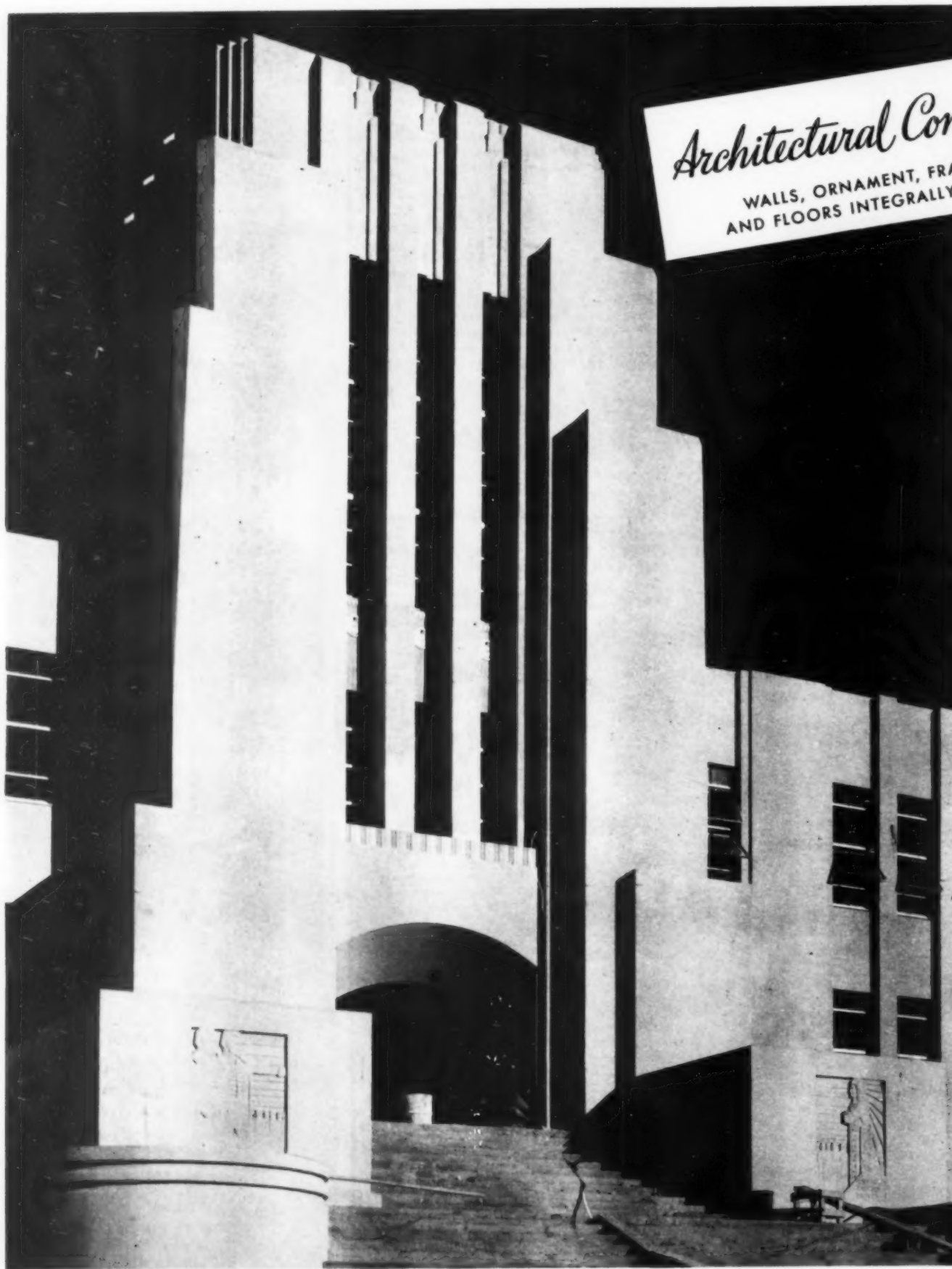
Mandrels and special equipment are not required for these shells because cold rolling and fluting gives them sufficient strength and rigidity to withstand hard driving. Because of reduced weight and continuous taper you drive more of them per hour. Each hammer blow counts.

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THE UNION METAL MANUFACTURING CO.
CANTON, OHIO

• Driving 60 ft. 11-gauge Union Metal Pile Shells for Southerly Sewage Disposal Plant, Cleveland, Ohio.





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like this are easy to build

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The number of such buildings has increased steadily and rapidly, and doubtless many of the structures coming up in your locality will be of this type. There is a special construction

Monolithic concrete Junior High School at Jackson, Miss. N. W. Overstreet and Town architects; W. J. McGee & Son contractors.

technique by which contractors can deliver high quality architectural concrete jobs at low cost. We'll gladly give you the details on request. Write for the free manual, "*Forms for Architectural Concrete*," and the handy "*Concrete Guide, with Tables of Quantities of Materials*."

PORTLAND CEMENT ASSOCIATION

Dept. 8-16, 33 West Grand Ave., Chicago, Ill.

A National Organization to Improve and Extend the Uses of Concrete

August, 1937 — CONSTRUCTION Methods and Equipment

HE-TIRES FOR HE-TRUCK JOBS!

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With the Right ONE on Your Trucks

No matter how extreme the punishment, these three great Goodyears will outperform from the start—keep going long after ordinary tires have been discarded.

They're built that way—for long life under heavy loads in killing dump truck service. Bodies are the toughest made—of patented, pre-shrunk Supertwist Cord and chemically-toughened rubber—blowout protection in every ply.

But hauling over mud, dirt roads, fields, loose rock and excavations calls for a variety of treads. That's the reason for three—each for a special purpose—one for the exact conditions under which

your trucks operate—one built to do your work better, longer and at lower cost than any tire you have ever known.

For example, the All-Weather Dump Truck Tire (1) is recommended for all-around dump truck work; the Pneumatic Lug Tire (2) where loose stones, sharp tread-wearing rocks are encountered; the Sure-Grip (3) for the mud, sand, soft-going.

With the *best made tire* and the *right type of tire* on your equipment, you'll be money ahead. Ask the Goodyear dealer near you for his recommendation for your trucks.

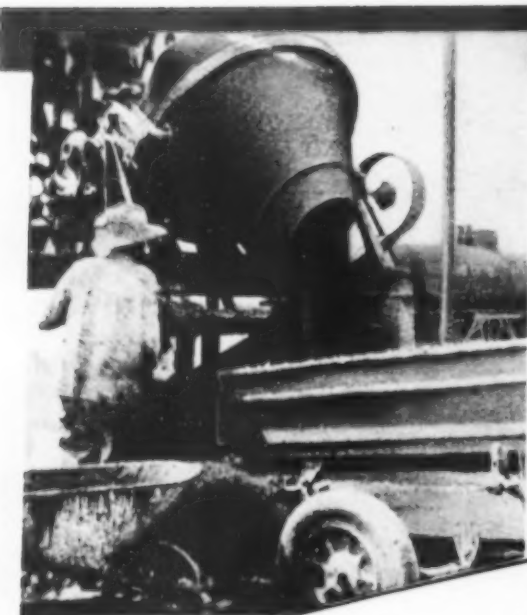
THE GOODYEAR TIRE & RUBBER COMPANY, INC., AKRON, OHIO

3 GREAT TIRES

GOOD YEAR

TIRES FOR DUMP TRUCKS

THERE'S A
GOOD YEAR
BATTERY
now!



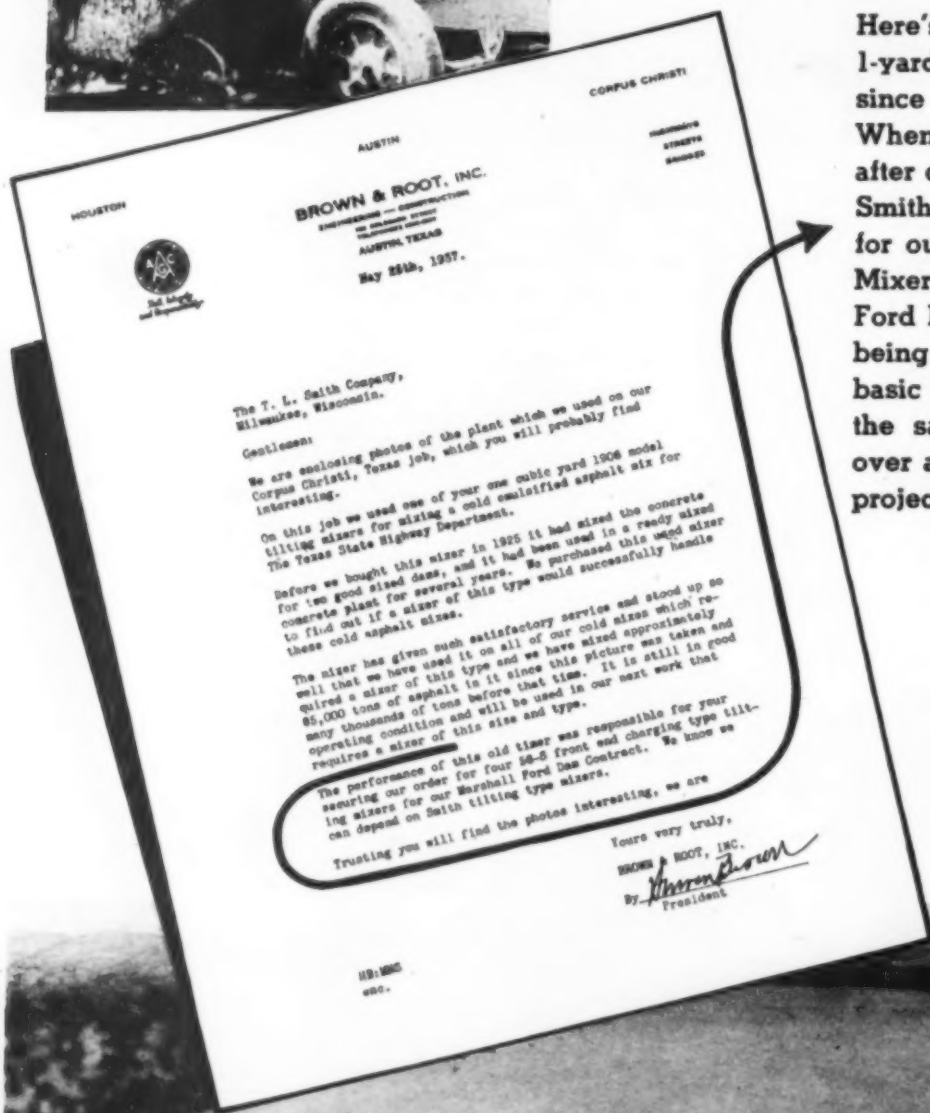
31 YEARS "YOUNG" and still going strong

Performance of Smith Old Timer Sells Four More Smith Tilters

Here's a letter that speaks for itself. A Smith 1-yard tilting type mixer has been on the job since 1906 — and it's still rarin' to go . . . When a mixer gives dependable service day after day for 31 years, it **MUST** be good. This Smith Tilter was so good it was responsible for our securing the order for the four 56-S Mixers which will be used on the Marshall-Ford Dam . . . Although the detail design is being constantly improved and refined, the basic Smith Tilting Mixer principle remains the same. It has amply proven its worth, over and over again, on the world's greatest projects. May we send you literature?



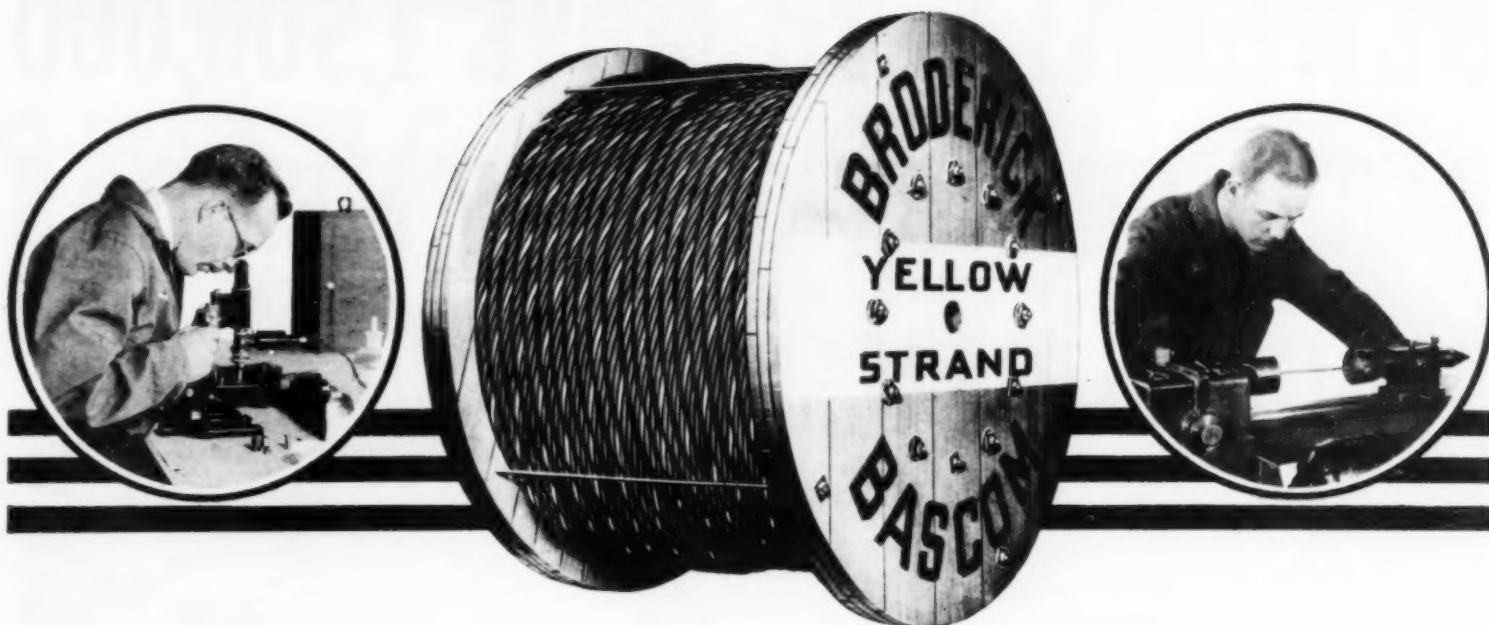
Four Smith 56-S Tilters equipped with **FRONT END CHARGING** will soon be pouring the million yards of concrete required for the new Marshall-Ford Dam in Texas. Brown & Root Inc. and McKenzie Construction Co.
(Plan view shown below)



THE T. L. SMITH COMPANY, 2851 N. 32nd Street, Milwaukee, Wisconsin

SMITH MIXERS

THE BOULDER DAM MIXERS



It MUST be Good To Pass These WIRE CENSORS

Only the best wire is good enough for Yellow Strand—the super-rope.

And only the best wire can get in, because, only after passing the most rigid tests under the watchful eyes of our engineers, is wire rated high enough for such important use.

Then those wires are selected for each rope which will produce the best balance of flexibility, elasticity, strength and toughness for the kind of work for which it is intended.

"Flex-Set" Performed Yellow Strand is this same highest quality rope with the strands preformed to the helical form they will maintain permanently.

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Let your next wire rope be "Flex-Set" Preformed Yellow Strand for all-round satisfaction.

BRODERICK & BASCOM ROPE CO., ST. LOUIS

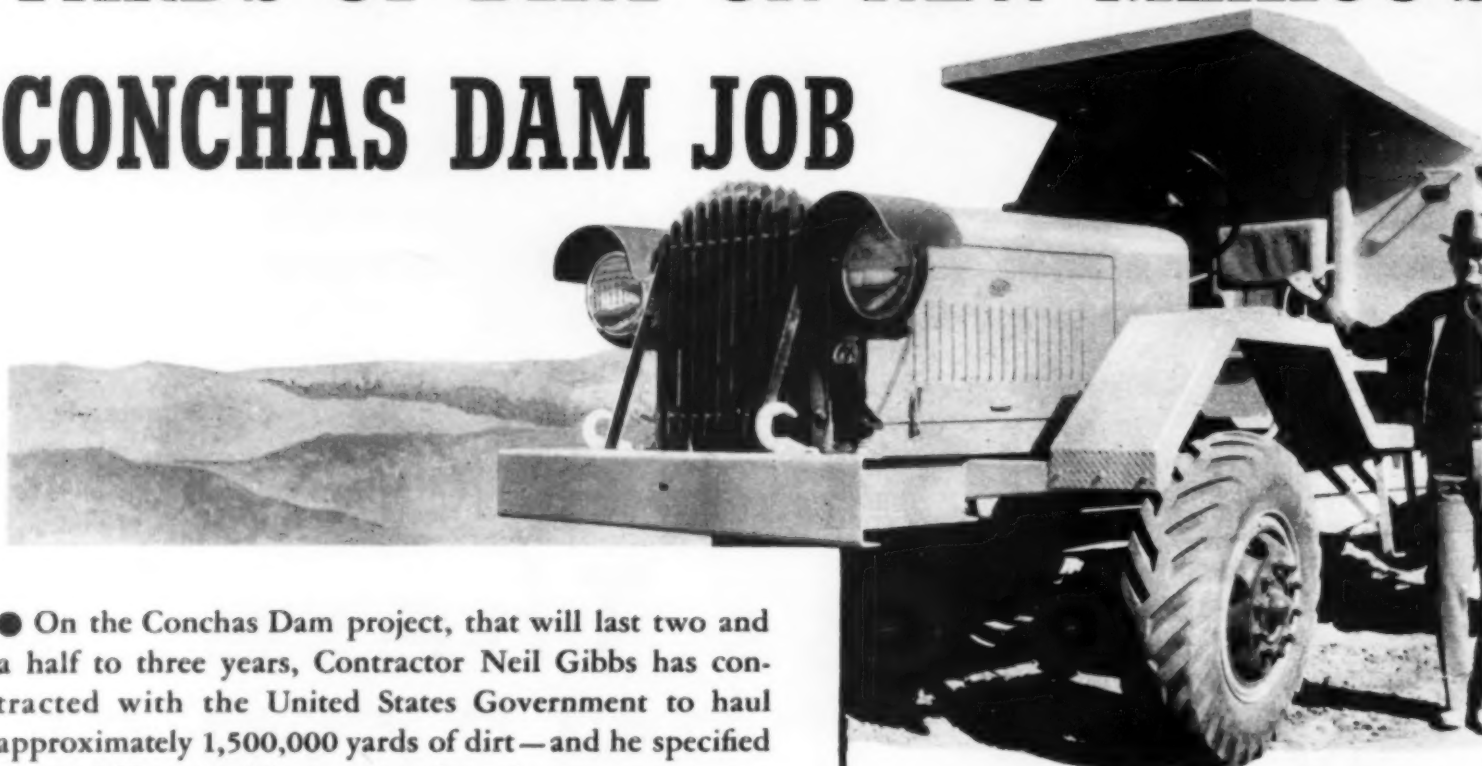
Factories: St. Louis, Seattle, Peoria.

Branches: New York, Chicago, Seattle, Portland, Houston

T-13R3

"Flex-Set" Preformed Yellow Strand

GENERALS TO MOVE 1,500,000 YARDS OF DIRT ON NEW MEXICO'S CONCHAS DAM JOB



● On the Conchas Dam project, that will last two and a half to three years, Contractor Neil Gibbs has contracted with the United States Government to haul approximately 1,500,000 yards of dirt—and he specified General Tires for his ten 8-yard trucks.

The dam is on the Canadian River in eastern New Mexico. The haul is in the pit itself—in gravel, loose dirt and rocks.

"I have chosen Generals," Gibbs says, "because of their traction and additional carcass strength."

Gibbs is using Generals also on the 27-mile haul from the railroad to the dam over a gravel road built and maintained by army engineers for accessibility to the dam.

Your General Tire dealer has a complete, specialized line of truck tires. He is a practical truck tire man with wide experience and knowledge. He can save you money. Call him in.

THE GENERAL TIRE & RUBBER CO. • AKRON, O.
In Canada — The General Tire and Rubber Co. of Canada, Ltd., Toronto, Ontario

NEW HEAVY DUTY CLEATED TRACTOR GENERAL

1. Deep cut "Chevron" tread is practically slip-proof in soft going.
2. Tread is self-cleaning in mud and sand.
3. Center riding rib, for smooth rolling and slow wear when running on hard surfaced roads.
4. Stronger, because of two extra plies running from bead to bead.
5. Cooler running due to patented *no-breaker-strip* construction.
6. Heavy dual and triple-cable beads.

GREATEST OBTAINABLE TRACTION

for excavation and oil field trucking, road machinery and all other heavy off-the-road work.

GENERAL TRUCK TIRES



EASY SHOPPING FOR THE NEW THINGS IN CONSTRUCTION

SEWER PIPE

1. Catalog. The Robinson Clay Products Company. 80th anniversary catalog giving complete line of vitrified clay sewer pipe, segment blocks, liner plates, "Acidware" pipe, wall coping, fire brick and clay pipe fittings.

PRINTING MACHINE

2. Folder. Ozalid Corporation. Describes type 600 dry developing machine for field and office use. Produces positive type print direct from the original subject without the aid of a negative.

FORM TIES

3. Concrete Tying Devices. The Richmond Screw Anchor Company, Inc. Four new devices added to line of tie rods.

DISK TAMPING ROLLER

4. Parsons Company. A tamping roller which is said to insure the proper kneading action on each layer of fill, packing the bottom layers of material first and building up a solid structure.

MOTORS

5. Continental Motors Corporation. New series of four-cylinder industrial engines, known as Series S-400, incorporating the principle of individual porting which is said to make possible a perfectly balanced, uniform flow of fuel. Furnished as either open type power unit with radiator gas tanks or as complete power units with housing and muffler.

HYDRAULIC SCAFFOLD

6. Decovator Scaffolding Corporation. A demountable scaffold that may be raised, extended or moved about by hydraulic mechanism actuated from the working platform. Raises from 3 ft. 2 in. to 22 ft. in height.

SHOVEL

7. Northwest Engineering Company. Model 20 is a new $\frac{3}{4}$ yd. shovel fully convertible to crane or dragline. Regularly furnished with a Wisconsin 6-cylinder gasoline engine but electric or Diesel power is available.

DRAWING STAND

8. Westbrook Equipment Company. A new table drawing stand for engineers and draftsmen which is said to attach securely to any size or shape of table in a few seconds.

BLUEPRINTING MACHINE

9. Paragon-Revolute Corporation. New 3H automatic blueprinting machine made up in two units which may be purchased and used separately as printer or finisher. Features are total utilization of light from arc lamp, revolving contact printing, and fast drying of prints.

CRAWLER MOUNTED SUBGRADER

10. Flynn Mfg. Corporation. Uniformly accurate and compact subgrading at high speed and low cost is claimed for this new machine powered by a 6-cylinder 66 hp. Wisconsin motor. Travels under its own power on the road forms on crawler treads.

EARTH EXPLORATION DEVICES

11. American Instrument Company. Two new tools for subsurface exploration by electrical methods are applicable to depths from 3 to 2,500 ft.

RIVETING ALUMINUM

12. Aluminum Company of America. Booklet of 35 pages includes design tables and specifications.

New equipment, materials and supplies of interest to civil engineers, contractors and staffs engaged in construction. It will be noticed that literature is available on some items. On other items the manufacturers will be glad to supply information. Manufacturers who are bringing out literature describing new or redesigned construction equipment, materials and supplies are invited to send such material to the Readers' Service Department of CONSTRUCTION Methods & Equipment.

CRUSHERS

13. Bulletin 263-H. Smith Engineering Works. Describes crushers of the Tel-smith and Gyraseph type. 16 pages.

METALLIC LEAD PIGMENT

14. Metalead Products Corporation. A new product that is claimed to be resistant to alkali dust, acid fumes and extreme temperature changes. Recommended for buildings, bridges, water towers and steel structures generally and as a priming coat on steel or a seal coat on concrete.

SMALL CONCRETE PUMPS

15. Chain Belt Company. Model 160 Rex Pumpcrete designed for the use of contractors having projects with a maximum of 5,000 cu. yd. of concrete to be placed, capable of handling a $\frac{3}{4}$ yd. mixer.

CLAMSHELL BUCKETS

16. Hayward Company. Model E-16. Re-handling bucket in capacities from $\frac{3}{4}$ to 4 yd. Cutting edges wider, one-piece shell is alloy steel.

CABLE PILING GRIP

17. Kellems Products, Inc. Grip of $\frac{3}{8}$ in. plow steel cable with 200,000 lb. tensile strength pulls piles from 14 to 18 in. in diameter.

TRUCK TIRES

18. B. F. Goodrich Company. "Earth Movers" for heavy service in construction field having capacities of 15,740 lb. per casing. Are mounted on 13 in. rims, weigh 449 lb., and are furnished in 12, 16 and 20 ply.

EXCAVATOR

19. Harnischfeger Corporation. P & H Model 855, all welded, alloy steel, 2 yd. Convertible as shovel, dragline, crane or clamshell. Hoist line speed 141 ft. per minute. Exerts pull of 26,000 pounds.

DITCHER

20. Cleveland Trencher Company. New model 110 ditcher cuts trench 10 $\frac{1}{2}$ in. to 23 in. wide, maximum depth 5 $\frac{1}{2}$ ft. at speeds ranging from 1 $\frac{1}{2}$ in. to 33 ft. per minute. Maximum traveling speed 3 miles an hour. Weight, 6 tons. Can be loaded on specially built trailer in 10 to 15 minutes.

For new literature or letter, describing these products check the items on the reverse side of this postage paid card. No obligation is attached.

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CONSTRUCTION Methods & Equipment

Readers Service Dept. No. 8

330 West 42nd Street

New York, N. Y.

HYDRAULIC VIBRATOR

21. Electric Tamper and Equipment Company. Jackson "Hydro Spade" consists of vibrating element driven by a compact hydraulic turbine enclosed in vibrator shell, which in turn is driven by continuously circulating light oil. Engine unit, mounted on removable pneumatic wheel, can be used to drive grinder or drill after removing vibrator.

MATERIALS HANDLING

22. Catalog 136. Gifford-Wood Company. A 112-page book describing and illustrating installations of all types of materials-handling machinery.

QUARRY EQUIPMENT

23. Bulletin 5371. Good Roads Machinery Corporation. Describes and illustrates complete line of crushers and other equipment such as elevators, conveyors, vibrating screens, etc., used in rock quarries and sand and gravel pits.

WEIGH-FEEDER

24. Bulletin 644. The Jeffrey Manufacturing Company. Describes the new Jeffrey-Traylor, "Waytrol" Constant Weigh Feeder. Applicable to feeding reagents such as alum, activated carbon, hydrated lime, or soda ash into municipal water systems, and other processes of continuous weigh-feeding, proportioning and batching.

TREE-MOVING CRANE

25. Gar Wood Industries, Inc. Crane is of goose-neck type, has live boom and is equipped with single and double-drum winch. Single-drum winch capable of 20,000 lb. pull. Designed for handling large trees in highway and park landscaping.

MONSTER TRUCKS

26. White Motor Company. Weight, 38,000 lb. empty. Equipped with 25 cu. yd. capacity steel dump bodies. Height, 10 ft. 8 in. with dump lowered. Capable of carrying 40-ton loads.

ROADSIDE ROCK CRUSHER

27. Eagle Crusher Company. One unit crusher with 35 hp. motor and heavy transmission built into one complete portable heavy-duty machine with two forward and one reverse speeds. May be adjusted for crushing from 1/4 to 3 in. stone while in operation. Weight, 12,000 lb.

PYREX BUILDING BLOCKS

28. Pittsburgh-Corning Corporation. A heat-resisting glass block made of the same glass as Pyrex ovenware, for use on exterior of buildings where they are subjected to severe and sudden temperature changes. Hollow units, 11 1/4 x 11 1/4 x 4 in. in size. Weight of block, 14 pounds.

NO POSTAGE REQUIRED . . . Simply encircle the item or items of interest, write in complete details regarding name and address. Drop in nearest mail box. CONSTRUCTION Methods & Equipment will do the rest.

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Name Title

Company

Address

Above lines must be filled in completely. Indicate whether address is home, office or project.

PUNCTURE-PROOF INNER TUBE

29. B. F. Goodrich Company. "Seal-O-Matic" tube seals punctures in tires while tire is in motion. Inner side of tube coated with layer of plastic self-sealing composition which closes hole without loss of air when penetrating object is removed. Product has been subjected to four years of actual road service and users have reported removal of scores of nails, screws and other articles from tires after months of uninterrupted operation.

OIL ENGINE

30. Pamphlet. Sterling Engine Company. Describing the Sterling oil-burning engine which has fewer working parts than a conventional engine and operates with lesser structural stresses. Crankless, opposed piston, two-stroke cycle, compression ignition.

Construction Progress As We Know It in This Country Is the Result of Collaborative Effort

Ask anyone who in the engineering construction industry is responsible for its vast accomplishments and nine men out of ten will say engineers and contractors. That is correct as far as it goes but it is only two-thirds of the answer. Who have speeded up the tasks of construction? Who have reduced construction costs? Who have made it possible to make more accurate estimates of time and costs?

The third party in the picture is manufacturers . . . the men who toil in laboratories and in plants to give engineers and contractors the tools and materials that reduce the drudgery, delays and dollars of construction.

Listed herein are some of the latest products of manufacturers.

VIBRATORS

31. Loose leaf folder. Viber Company, Ltd. Illustrates and describes complete line of pneumatic and electric concrete vibrators.

SAFETY ENGINEERING

32. Booklet. American Mutual Liability Ins. Co. "To Get the Job With A Conservative Bid" explains opportunities in safety engineering to reduce losses in time and money and lower insurance costs.

BITUMEN HEATER

33. Bulletin 101. Easton Car and Construction Company. Describes Easton-Clarmac Electric Bitumen Heater with entirely automatic temperature control. Claimed to save 25 to 50 per cent in heating costs compared to steam boiler method.

"ELIPTEX" SCREENS

34. Bulletin 99A. Robins Conveying Belt Co. Describes new horizontal screens available in single, double or triple deck. Unique elliptical motion provides effective screening and feeding action at high capacity.

WELL POINTS

35. Booklet. Griffin Wellpoint Corp. Photographs of various difficult dewatering jobs with brief descriptions of conditions encountered.

ROOFING

36. Booklet. The Flintkote Company. "Facts About Roof Maintenance" is of special interest to building contractors and to distributors of construction materials.

SLUDGE PUMPS

37. Pamphlet. Ralph B. Carter Co. 12 pages of illustrations and specifications of Carter pumps designed for sewage disposal plants.

JACKS AND TRENCH BRACES

38. Folder. Joyce-Cridland Co. Describes and illustrates line of locomotive screw jacks, jacks for house moving and industrial use, heavy-duty shoring jacks, house-raising jacks and trench braces for widths 22 to 70 in.

BLAST HOLE DRILL

39. Bucyrus-Erie Co. For putting down 9 to 12 in. holes at fast drilling rate. Swings up to 6,000 lb. of cable-tools, concentrating large amount of energy at bottom of hole. Diesel or electric power.

PNEUMATIC CONCRETE PLACER

40. Ransome Concrete Machinery Co. Especially adapted for such work as lining tunnels. After mixed concrete has been deposited in charging receptacle, horizontal sliding door operated by compressed air is forced against machined seat, sealing intake opening. Air jet cleans sealing door. Made in 1/4, 1/2, and 1 cu. yd. sizes.

LIGHTWEIGHT DRILL

41. Ingersoll-Rand. For light rock drilling such as block-holing, trimming, scaling, sinking holes for conduits, pipes, railing and foundation bolts. Dry model weighs 30-lb; wet model, 32-lb.

VISIBLE RECORD FORMS

42. Acme Card System Co. For keeping Social Security data in shape for government inspection. Visible record book available for employers with less than 14 employees; large binder for from 30 to 50 employees; tray cabinets for employers of 300 or more.

SIMPLIFIED PAYROLL METHOD

43. Pamphlet. Felt & Tarrant Mfg. Co. Describes "Comptometer" payroll method for recording employee records with respect to earnings and deductions of all kinds. Designed for use in connection with The Social Security Act.

ROOFING AND SIDING

44. Folder. Johns-Manville. Describes and illustrates methods of cutting maintenance costs on industrial roofing and siding with J-M corrugated Transite. Shows how product can be applied by average workmen.

SHEET METAL GUIDE

45. 63-page booklet. Carnegie-Illinois Steel Corp. Designed to give useful information on properties and uses of U. S. Steel Corp's various products. Notes on painting sheet metal.

PROTECTIVE COATING

46. Booklet. Quigley Company, Inc. Heavy-duty black for application to steel surfaces by brush or spray to prevent corrosion. Coverage approximately 350 sq. ft. per gallon. No prime coat necessary.

SHOVEL BOOM

47. The Thew Shovel Co. A new "front end" for the 1 1/2 yd. Lorain 77, claimed to be the strongest shovel boom per pound of weight ever designed.

BELT CONVEYORS

48. 116-page catalog. Barber-Greene Company. Combined catalog and manual with 20 pages devoted entirely to engineering data.

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"WE TORE 'EM APART"

How Shell helped to bring this company through a tough job—with no breakdowns!

J. Perini & Sons, Inc., of Framingham, Mass., were faced with the widening of a section of the Cape Cod Canal

NO CHANCES could be taken, not a possibility of guarding against breakdown overlooked. For every piece of equipment must undergo 24-hour service on this job!

Shell was selected to help bring Perini through ahead of time. Shell men inspected every piece of Perini equipment. Trucks, tractors, shovels, dredges, bulldozers, cranes and compressors . . . all were closely inspected—many were literally torn apart!

Then, in every unit . . . the *correct* Shell Lubricants were applied. The lubricants tested on hundreds of tough construction jobs!

Results speak for themselves. The Perini equipment came through with flying colors. Every unit operated 24 hours a day for a period of months without breakdown due to lubrication failure, and the job was completed ahead of contract schedule!

NOTICE THIS: Shell met this problem with an ingenuity and resourcefulness born of long experience and complete knowledge of every unit involved. This is Shell's "Invisible Element" . . . the ability to put the right lubricant in the right place at the right time . . . a "plus" in lubrication that is yours for the asking. Write or call your nearest Shell office.



SHELL CONSTRUCTION LUBRICANTS

Where Dependable BRAKING & CLUTCH Service Counts!



THERE is a good reason why most manufacturers of shovels, draglines, cranes and similar equipment have for years standardized on J-M Friction Materials. Their machinery represents a major investment . . . and therefore, they cannot afford to use any parts in their equipment except those which promise the utmost in durable, efficient service.

Johns-Manville's leadership is maintained by the thoroughly dependable performance of its friction materials under a wide variety of the toughest service conditions. Throughout their many years of use, J-M Brake and Clutch Materials have provided for more accurate control and greater efficiency of excavating equipment working at maximum capacity.

For details on linings and blocks designed for industrial work, write for our brochure, "Johns-Manville Industrial Friction Materials." Johns-Manville, 22 East 40th Street, New York City.



Johns-Manville

INDUSTRIAL FRICTION MATERIALS

Check the advantages of

BLAW-KNOX

TRUKMIXERS



DEPENDABLE PERFORMANCE



QUALITY CONCRETE



MAXIMUM PROFITS

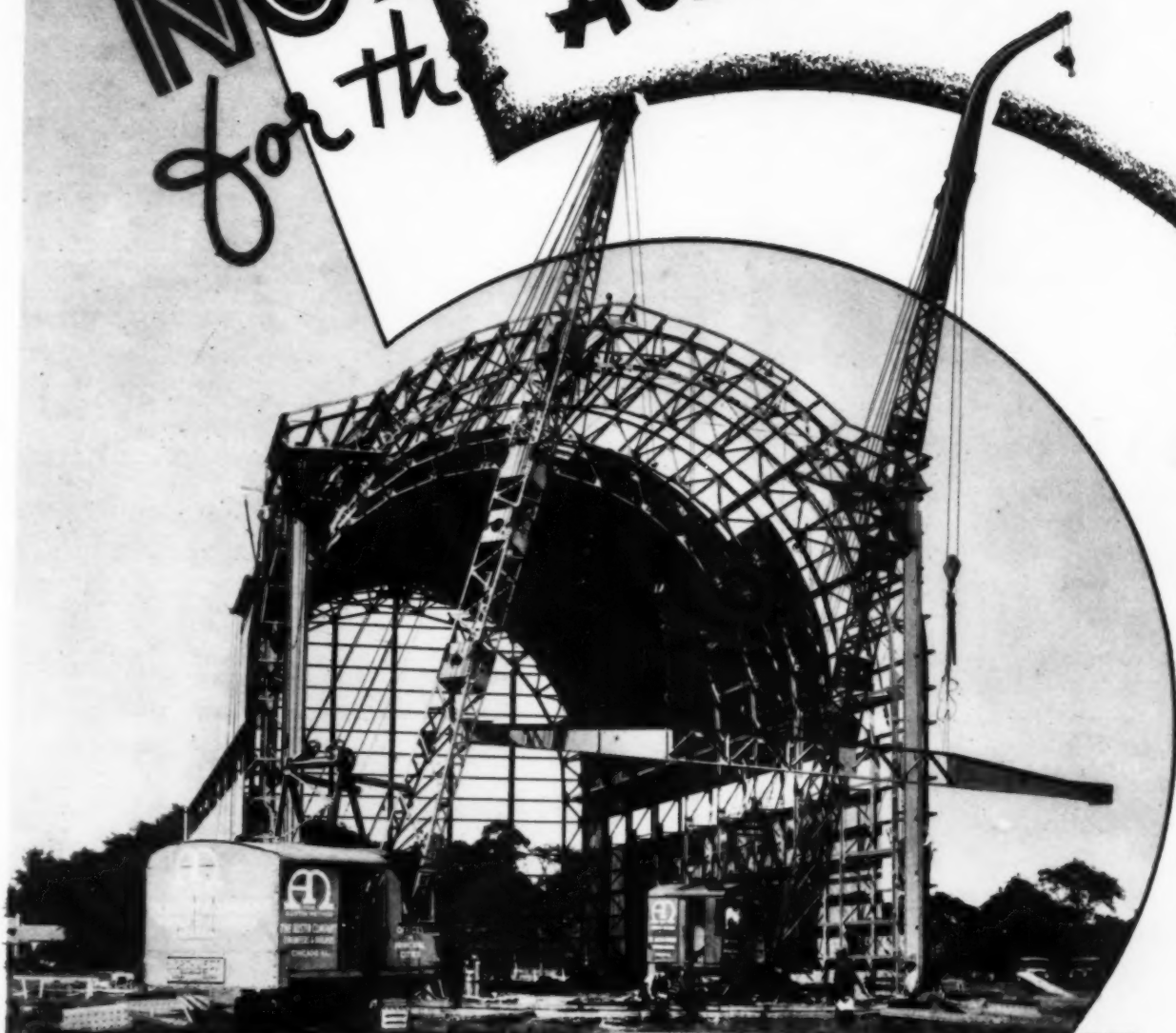


You will obtain a greater share of the concrete business and profit for your plant with Blaw-Knox TRUKMIXERS and Agitators because they mix concrete faster and better.

We would like to tell you why Blaw-Knox Trukmixers not only get business and profits for you, but save you money in low depreciation and maintenance costs.

BLAW-KNOX COMPANY
2086 FARMERS BANK BUILDING PITTSBURGH, PA.
Offices and Representatives in Principal Cities

Another NORTHWEST for the AUSTIN COMPANY CHICAGO



WHEN it comes to steel erection, Northwest has something for you that means extra speed. This is proved by repeat orders from some of the leading steel erectors in the country.

Take the Austin Company of Chicago—two more Northwests for steel erection—that makes a total of five on this class of work over a period of thirteen years.

The Northwest's ability to handle long booms—the worm boom hoist supplemented by a third drum for a live boom, a snaking line or holding line; the "feather-touch" clutch control and "variable speed motor," decelerator controlled, assure a combination that gives the utmost in accuracy under all conditions of steel erection or handling forms. Ask the Austin Company!

NORTHWEST ENGINEERING CO., 1728 Steger Building, 28 East Jackson Boulevard, Chicago, Ill.

SHOVELS, CRANES
DRAGLINES
PULLSHOVELS
SKIMMERS

NORTHWEST

GASOLINE, OIL
DIESEL OR
ELECTRIC
POWERED

BUILT IN A RANGE OF 18 SIZES — 3/8 YD. CAPACITY AND LARGER

**IT
CAN
BE
DONE
WITH
WIRE,
BANDS OR
RODS**

ERECTING FORMS

- Make wood spreaders
- Place wood spreaders
- Cut material for ties
- Drill holes in forms
- Place ties
- Tighten ties

STRIPPING FORMS

- Cut ties to remove forms
- Chisel ties at face of wall

(In addition, the stretch or slip in ties of above type costs you more in concrete)

But

**YOU SAVE
30 TO 50%
OF FINAL COSTS**

by using

**RICHMOND
SNAP-TYS**

or

**RICHMOND
TYSCRUS**

ERECTING FORMS

- Drill holes in forms
- Place ties
- Tighten ties

STRIPPING FORMS

(when Richmond Snap-Tys are used)

- Remove holder to remove forms
- Bend tie ends to break at surface, 1/4, 1/2 or 1" back of surface

(when Richmond Tyscrus are used)

- Unscrew bolts and remove forms

It's the *final* cost that tells the story of form-tie economy. Compare the ease and speed of using pre-fabricated Richmond Snap-Tys or Richmond Tyscrus, with the labor and expense of using wire, bands or rods, and you'll find Richmond Form-Ties save you 30 to 50%. Compare performances, and you'll find Richmond Form-Ties can't slip — meet all specifications, pass the most rigid inspection — afford you double the strength.

Before you invest in tying devices for your concrete work, let Richmond show you how you can save time, labor and material — and assure better efficiency besides. There's no obligation.

RICHMOND SCREW ANCHOR CO., INC.

Tying Devices for Concrete

241-251 BUSH STREET



BROOKLYN, NEW YORK

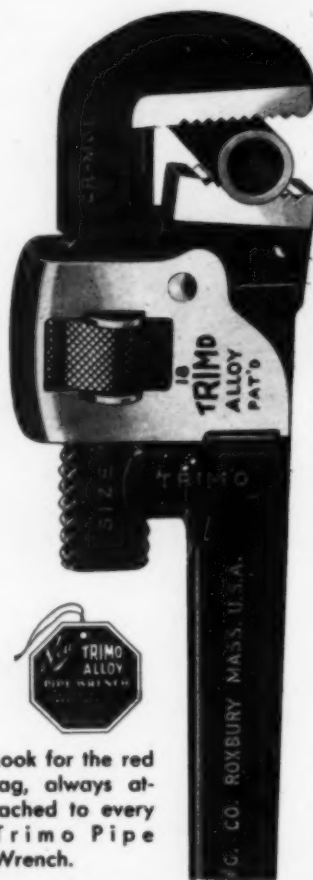
★ EFFICIENCY ★

As building increases in volume, new efficiency characterizes construction methods. Keeping pace with this new efficiency is

TRIMO

an efficient pipe wrench because it is made of Chrome Molybdenum Nickel Alloy Steel, Drop Forged... hangs on with a grip that means maximum safety... replaceable parts give maximum economy.

TRIMONT MFG. CO., INC.
Roxbury (Boston), Mass.



Look for the red tag, always attached to every Trimo Pipe Wrench.



TRICROME
CUTTER WHEELS

Made of thin blade special analysis steel, silvered to resist rust. Identified by the red hub. Made especially for Trimo Pipe Cutters but can be used in other types.

BETTER PERFORMANCE LONGER SERVICE ON ANY JOB

"DIXON" AIR HAMMER COUPLINGS



Designed and built to withstand the continual vibration of hand hammers and rock drills, this Dixon coupling has a longer, consistently economical service life on the toughest job. And, like the "Boss," it is rust-proofed by Cadmium Plating.

"BOSS" HOSE COUPLINGS



Used for steam hose, steam hammers, air, hydraulic or road builders' hose... "Boss" Couplings have no equal for dependability in service. Parts are of steel or malleable iron to withstand abuse... Cadmium Plated for rust proofing.

Furnished in Washer or Ground Joint Type.

DIXON
VALVE & COUPLING CO.

LOS ANGELES

PHILADELPHIA

HOUSTON

Carried in Stock by Leading Rubber Manufacturers and Jobbers.

INTERNATIONAL *Announces* Two New TRACTRACTORS

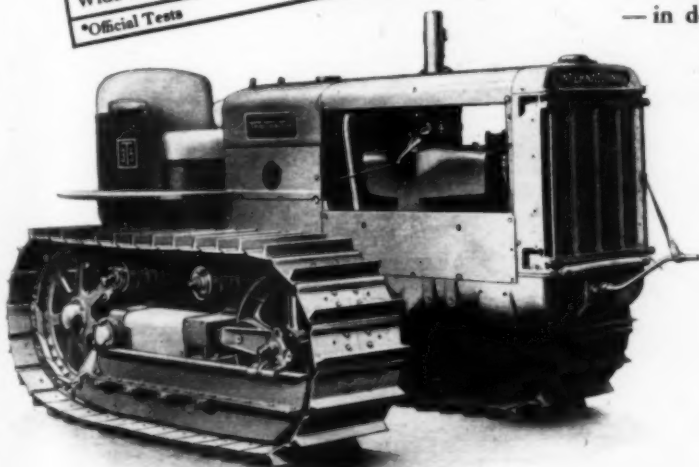


The International Model TD-35 DIESEL TracTractor brings new economy in crawler-tractor power to construction projects, road building and maintenance, and many other jobs—working alone or with a variety of equipment built around it.

Brief Specifications

	Model T-35	Model TD-35
*Belt horsepower (max.).....	46	43
*Drawbar horsepower (max.).....	38.5	36
Speeds in m.p.h. at 1750 r.p.m.....	1½ to 4	1½ to 4
Number of cylinders.....	6	4
Bore and stroke, inches.....	3¼ x 4½	4½ x 6½
R.p.m., full-load engine speed.....	1750	1100
Length overall, inches.....	132¼	132¼
Width overall, inches.....	58¼	58¼
Height, base of shoe to top of air cleaner, inches.....	76¼	76¼
Shipping Weight (approximate).....	10,050	10,550
Wide tread.....	10,800	11,300

*Official Tests



International Model T-35 TracTractor

● The popular features which have won International TracTractors such an enviable position in the crawler tractor field are now available in two new TracTractors. One is the Model TD-35 DIESEL, which follows the design of the larger Model TD-40 and brings you the many advantages of the International DIESEL Engine in a somewhat smaller tractor at a lower price. The TD-35 is a true DIESEL—in design, performance, and economy—yet it starts on gasoline and converts itself automatically to full DIESEL operation after warming up for one minute or less.

The other new TracTractor is the Model T-35—a 6-cylinder spark-ignition-type tractor built for efficient operation on gasoline or distillate.

With the exception of the engines, these two new TracTractors are practically identical. Both feature variable-speed governors; 5-

speed transmissions; ball bearings at 43 points; replaceable cylinders; Tocco electrically hardened crankshafts; special dust seals; fuel strainers; air cleaners; oil filters; and unit construction throughout. With this type of construction, important working parts may be removed as units, enabling the owner to make adjustments or replacements in the shortest possible time. This important time-saving feature keeps maintenance costs down.

These two new International TracTractors (available in standard or wide tread) are already serving many branches of industry, adding to the reputation built up through the years by the International T-20, T-40, and TD-40 DIESEL. International Industrial Power also includes a full line of wheel tractors, and power units in sizes up to 110 maximum horsepower.

The nearest International Industrial Power dealer or Company-owned branch will gladly supply complete details on request.

INTERNATIONAL HARVESTER COMPANY
606 So. Michigan Ave. (INCORPORATED) Chicago, Illinois

INTERNATIONAL Industrial Power

Killefer road equipment

Revolving
Scrapers
Revolving
Rippers
Regular
Rippers
Road Discs,
or Planers
Compacting
Harrows
Oil-Mix
Cultivators
Ditchers
Mole-Drain
Machines

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Literature

A SELF-CLEANING ripper for tractors of 30 to 50 H.P. Rugged and strong. Weight 4050 lbs. Tool-head revolves completely to clear obstructions or to stop digging. Heat-treated standards and points.

Great clearance under frame and between points. Accurate depth adjustment. Point spacing 16". Depth 14". Timken-equipped wheels. One-rope control. Two larger models. Write for folder R-64.



Sold by "Caterpillar" Distributors everywhere. Killefer Mfg. Corp. Ltd., Los Angeles, Cal., Peoria, Ill.

No. 140 Revolving Ripper



**SPEED
KING**

JAEGER'S 10S BRIDGE BUILDER

fastest selling, fastest performing mixer--on the road, on the job!

Trails at 35 m.p.h. on two pneumatic tires, Timken bearings--loads and discharges faster, even with stiffest concrete--and discharge cuts cost of placement in the forms. Also built in 75 size. Get new Catalog and prices.

The JAEGER MACHINE Co.
800 Dublin Avenue
Columbus, Ohio



OTHER SIZES TYPES
3 1/2 to 545



*Here's a
"Quick-Way"
to solve your
Shovel Problems*

THE ANSWER to the Construction Industry's long felt need for a light weight power shovel that will stand the gaff of heavy duty work and produce yardage--the Quick-Way Truck Shovel!

Quick-Way is the only truck shovel with every essential part extra large, yet with all unnecessary weight eliminated so that outriggers, ground jacks, counter-balances, extra wheels, etc., are not needed. It is the only truck shovel guaranteed to perform as claimed...and on one rear axle!

**The Quick-Way Truck
Shovel Co.**

DENVER COLORADO



QUICK WAY to do the job - QUICK WAY to the next one!

MORRISON & KNUDSEN

of Boise, Idaho

PLACE A
REPEAT
ORDER

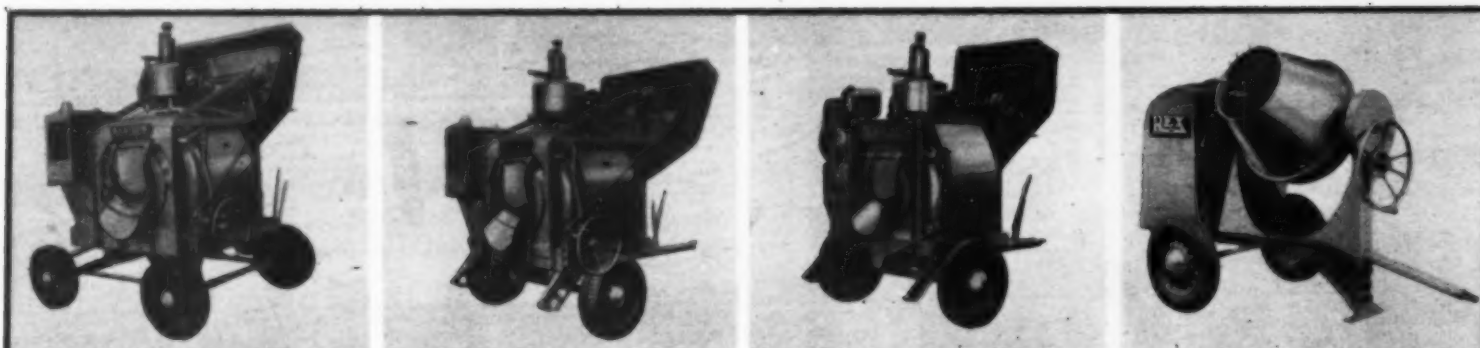
Road construction takes the measure of any engine, gas or diesel. When Morrison & Knudsen, one of the largest contractors in the west, place a *repeat order* for THREE 250 h.p. Cummins *Dependable* Diesels, isn't it time for all contractors who need low-cost power to investigate the Cummins Diesel?

Have you considered the economy of re-powering your shovel, dragline, compressors or rock crushers with a Cummins *Dependable* Diesel? Get the facts from your nearest dealer. Cummins Engine Co., 1420 Wilson Street, Columbus, Indiana.



CUMMINS *Dependable* DIESEL

PIONEER IN MODERN DIESEL DEVELOPMENT



REX 10 S

REX 7 S

REX 5 S

REX 3 1/2 S

\$

ARE
YOU BUYING
A MIXER?

\$

SEE THE DOLLARS WORTH \$ YOU
GET \$ WITH THE REX LINE \$

Whether it's a 3 1/2-S or a 10-S mixer, there's greater yardage-years of service in it if it's a Rex. For only Rex offers you the modern features of design that count most towards longer, repair-free mixer life — Pressed Steel Drum Head, Pressed Steel Drum Rollers, Positive Chain Drive, Motor mounted "Above the Dirt Line," Rex Shimmy Skip, Rex One-Man End Controls and Rex Accurate Water System. Sizes from 3 1/2-S to 14-S — end or side discharge types with two or four wheel mountings and pneumatic tires optional. Before you buy, it will pay you to investigate the Rex line of modern mixers.

CHAIN BELT COMPANY, 1664 W. Bruce St., Milwaukee, Wis.

SEND FOR CATALOGS TODAY!

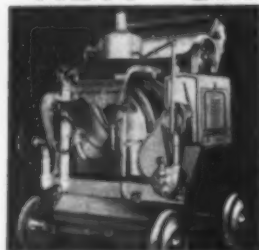
CHAIN BELT COMPANY
OF MILWAUKEE

REX

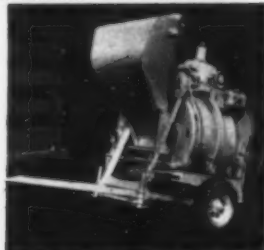
Speed Mixers



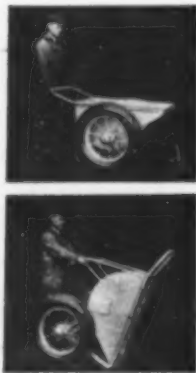
... *Speed* ...
NEW CMC MIXERS



CMC 7s and 10s End Discharge Models. New — compact — fast. The advantages of a speedy trailer with four wheel stability.



CMC 5s — 7s — 10s Two Wheelers. The fastest moving — fastest working one and two bag Mixers ever developed.



**MONEY-MAKING EQUIPMENT
FOR THE CONTRACTOR**

Know the CMC Line before you buy. Greatest equipment values ever offered by anyone any time. New catalog shows the full line of CMC Mixers — all sizes — Wonder Tilters — Dumpover Pneumatic Tired Carts (See illustrations), Hoists, Pumps, Saw Rigs, Wheelbarrows.

Write today for your copy!

**CONSTRUCTION MACHINERY CO.
WATERLOO — IOWA**

K & E WYTEFACE
STEEL MEASURING TAPES

*Easy
to read...*

easy to clean, and the crack-proof white surface protects the steel from rust. Ask your dealer, or write for complete information.



KEUFFEL & ESSER CO.

BROOKLYN, N. Y.
NEW YORK CHICAGO ST. LOUIS SAN FRANCISCO DETROIT MONTREAL

**NEW feet for
old... at a fraction
of the cost... and time!**



The Shoes are REMOVABLE

(Patents Pending)

With *maintenance* costs rising, here's a Tamping Roller every contractor will *welcome*! The shoes are renewable without cutting torches and welders. Anyone who can swing a hammer can change the shoes — on the job — between shifts — with no delay. There's no doubt about it, the SOUTHWEST Tamping Roller (with removable shoes) will last indefinitely — work better and more efficiently, over a longer time. It can *always* be "up to" its greatest tamping ability.

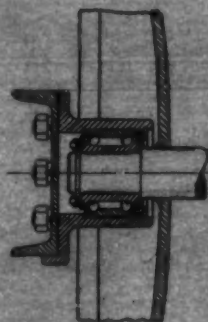
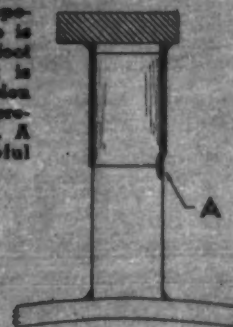
No lubrication either! The special, heavy-duty radial and thrust ball bearings are *sealed* in for good. You can forget about "internal" maintenance forever.

And another thing: remember that *all* SOUTHWEST Tractor Equipment *surpasses* exacting Government and State specifications. The exclusive "Lucas Process" of arc welding the finest heavy steel plate insures this. Yet you pay no more for SOUTHWEST Equipment than ordinary tractor equipment.

There's a SOUTHWEST tractor attachment for all your earth moving needs.

SOUTHWEST WELDING & MFG. CO., INC.
ALHAMBRA CALIFORNIA

A sectional drawing of the Southwest Shoe assembly for the "special" tamping roller. The shoe is driven on the tapered steel foot and the edge of the socket is simply peened over the depression (as shown at point "A") thus preventing loosening or turning. A permanent fit for long, useful service.



NO LUBRICATING

The bearings are of the sealed type requiring no further lubrication. The combination heavy duty radial and thrust ball bearings are assembled in cast steel housings, sealing lubricant in and dust and dirt out. Six bolts hold the assembly to the tamping roller; the thrust component held by the ball bearing makes acute angle operation possible.

SOUTHWEST TRACTOR EQUIPMENT

3 New Bulletins
are now available
describing Southwest
equipment. Write for them.



Contractors!



Don't WISH for PERFECT SERVICE— Call on GOODALL

Ready for instant delivery is a complete line of everything you could possibly need in the way of hose and rubber goods — dependable products especially designed and made with the requirements of a contractor in mind.

Ready for you, too, is the kind of service you want and *should have*. After 30 years of intimate contact with the contracting business, it is natural that we should know not only *what* you need, but *when*.

LIST OF PRODUCTS

Subway Air Hose	74 Steam Hose	Inferno Steam Hose	Grout Hose
Conveyor Belts	Mucker Belts	Elevator Belts	Packing
Red Ring Dredge Steves	Roadbuilders	Water Hose	Rubber Boots
All-Good Cord Air Hose	Concrete Placing Hose	New-Type Cord Section	
Discharge Hose	Power King Raw Edge Belting	"S.S.S." Belting	
Leather Soled Boots	Rubber Clothing	Oiled Clothing	

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GOODALL MECHANICAL CORP.

SAN FRANCISCO • LOS ANGELES • SEATTLE
FACTORY: Trenton, N. J.

Distributors in Principal Cities

GOODALL

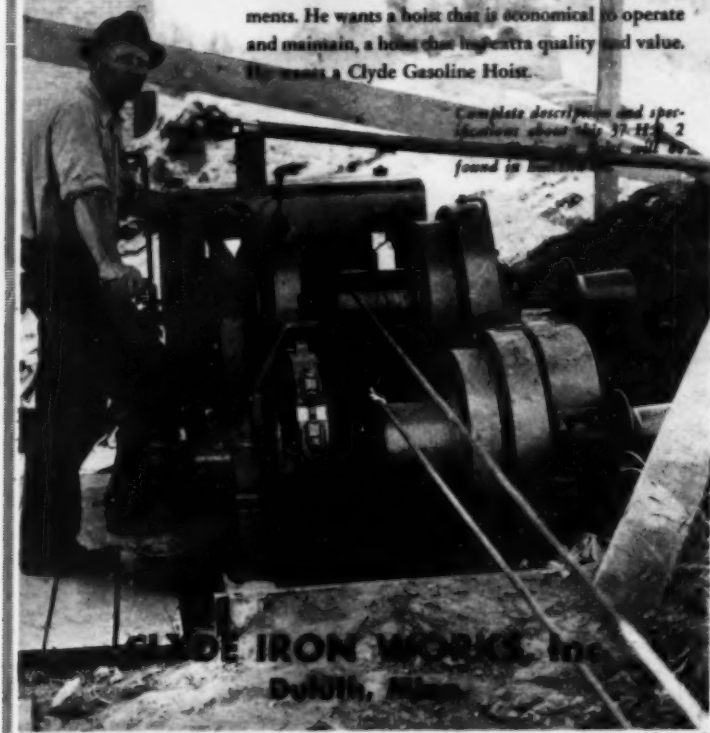
The originators of the
"Standard of Quality" Line
(Reg. U. S. Pat. Off.)
of contractors rubber goods



Ask the operator!

He wants a hoist that will supply him with a minimum of time out for repairs or adjustments. He wants a hoist that is economical to operate and maintain, a hoist that has extra quality and value. He wants a Clyde Gasoline Hoist.

Complete description and specifications about this 37-H.P. 2 found in Bulletin 237.



"135" BREAKS ALL SPEED RECORDS



HAISS MODEL "135" LOADER
PUTS UP 8 YDS. OF CRUSHED STONE IN 1 MINUTE

Without getting out of the price range of a loader-type machine, competes in capacity with BIG equipment. It fills the need of the quarryman, sand pit operator or contractor who wants to dispatch big trucks FAST. Like all Haiss high-powered Loaders it has a locomotive rather than a truck-type transmission, and the Haiss-patented worm-driven slow crowding speed working with a revolving paddle self-feeding device.

Whatever your present truck loading method, you owe yourself a reading of the "135" Bulletin.

GEORGE HAISS MFG. CO., INC.

139th St. & Canal Pl., New York

Represented in all Principal Cities

ASK FOR BULLETIN 237 ON FAMOUS HI-POWER CLAMSHELL BUCKETS

For Small Shovels, Too— Electric Drive Costs Less For Upkeep



ELECTRICITY as the drive for your small power shovels will enable you to excavate more tonnage and to excavate it more rapidly than with a friction-driven shovel. Electrical acceleration is faster and smoother, and there is less time out for clutch maintenance and other repairs.

The greater availability and speed of electric shovels have been demonstrated repeatedly on the big power shovels.* Why not apply the same advantages to the jobs where you use small ones?

By means of either variable-voltage or rheostatic control, changes in speed are made instantly and with negligible mechanical wear. Furthermore, with electric drive, the diesel engine or gasoline engine driving the generator operates continuously at its most efficient speed. Thus you get the maximum efficiency of the engine continuously. General Electric, Schenectady, N.Y.

*One contractor wrote that he took his G-E equipped shovel out of service temporarily, not because it was necessary to do so, but because he felt that any equipment that had been in operation for five years without interruption should have a rest.

YOU GET SPEED FOR THE JOB, MORE SERVICE FOR YOUR MONEY, WHEN YOU SPECIFY G-E EQUIPMENT

GENERAL  ELECTRIC



A Perfect Shoulder in ONE Operation

RIGHTLY PRICED

SOUNDLY ENGINEERED

NATIONALLY SERVICED

Two men, a tractor and an Insley Shoulder Finisher will grade and finish both sides of a mile of roadway in one day . . . every day (weather permitting) . . . and always a perfect job. This means one important thing . . . low cost.

There is a size and model INSLEY to handle every type of shoulder finishing. Write today for complete specifications and prices.

INSLEY MANUFACTURING CORP., INDIANAPOLIS, INDIANA

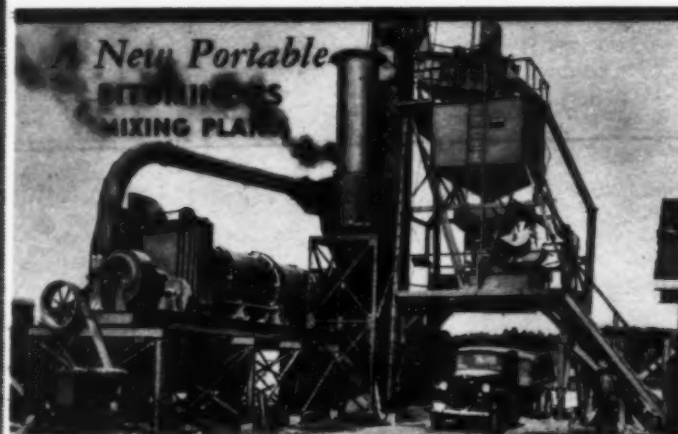


**Any Width to 14 Ft.--
Laid Smooth as Velvet--
Faster than Your Plant Can Mix**

With its 18 ft. straight-edge runners to equalize the surface, its semi-crawler traction all on hard subgrade, its pug-mill spreader, its ability to blend smooth joints and adjustability up to 14 ft. widths—the Jaeger Paver lays precision smooth pavements, faster and at lowest known cost. Send for Catalog and Prices.

THE JAEGER MACHINE CO. 800 Dublin Avenue
Columbus, Ohio
World's Largest Builder of Spreading and Finishing Machines

JAEGER Bituminous PAVER



FOR MODERN ROADWORK

... at Low Cost

This plant was designed to meet the demand for the economical improvement of secondary roads. We have built several to date and they have proved their worth in actual service. No investment is needed for a running gear, plant adapted to standard flat bed truck and trailer hauling.

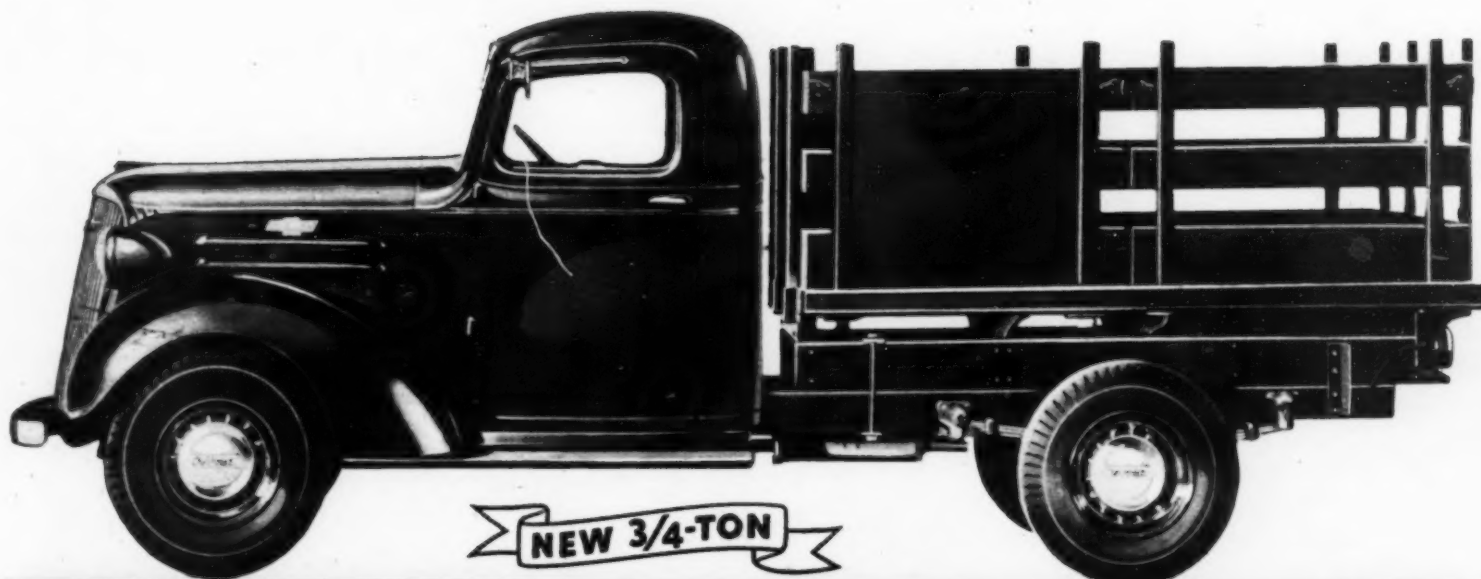
Some Details

- Can be erected by 3 or 4 men in a few days.
- No erection equipment required. Plant equipped with hoist and jib crane.
- Built in 2 units (dryer unit; and screening and mixing unit).
- Comply with most highway loading and clearance regulations.
- SKF bearings throughout. Fully enclosed vibrating screen. Steam-jacketed, steam-operated steel mixer. Large combustion chamber and dust collector.
- Write for Bulletin T-250.

HETHERINGTON & BERNER, INC.

701-745 Kentucky Avenue

Indianapolis, Ind.



NEW 3/4-TON

CHEVROLET

ANNOUNCES NEW 3/4-TON AND 1-TON TRUCK MODELS



LIGHT DELIVERY MODELS



HALF-TON MODELS—112" W.B.



3/4-TON MODELS—122 1/4" W.B.



1-TON MODELS—122 1/4" W.B.



1 1/2-TON MODELS—131 1/4" W.B.
AND 137" W.B.

Choose trucks that exactly fit your haulage and delivery requirements from 5 different load capacities

By the addition of these new truck sizes, Chevrolet extends new operating economies to thousands of truck users—the economy of trucks that completely fit each haulage or delivery job. Make your selection from five separate Chevrolet truck lines—each offering a different size and different load capacity. All offer Chevrolet's famous performance and unmatched operating economy.

CHEVROLET MOTOR DIVISION, General Motors Sales Corporation, DETROIT, MICHIGAN

General Motors Installment Plan—monthly payments to suit your purse.

FOR ECONOMICAL
CHEVROLET
TRANSPORTATION



NEW 1-TON

"MORE POWER per gallon - LOWER COST per load"

No Caps in the Hole

The work entailed in loading bore holes has been simplified and made less hazardous through the use of Cordeau-Bickford Detonating Fuse. This insensitive material, acting as the connecting and detonating agent for each cartridge in each load, eliminated the need for sensitive detonating caps within the holes. Loading, stemming and tamping may be done as expeditiously as the proper handling of such blasting materials will permit. When the load is ready for blasting, the length of Cordeau detonates every cartridge in the hole—completely and simultaneously.

Time saved is money earned. Cordeau-Bickford will show increased efficiency on many types of jobs, both large and small.

THE ENSIGN-BICKFORD COMPANY
SIMSBURY CONNECTICUT

SIMPLIFIED LOADING



**CORDEAU-BICKFORD
DETONATING FUSE**

98% of your questions answered in these two books

By G. UNDERWOOD
Construction Engineer

Estimating Construction Costs

630 pages, 6 x 9, 443 charts, 36
illustrations, flexible, \$6.00

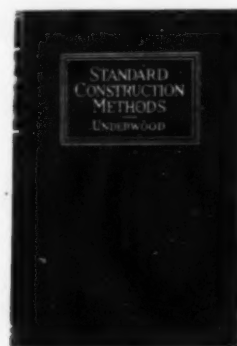


THIS book provides a simple chart system that gives construction costs at a glance and takes long and tedious headwork out of estimating. Over 400 of the charts are given in ready form for handy use, and cover the estimating of transportation, labor and material costs for all kinds of construction work. The book also presents a complete model estimate for a typical small building, together with a step-by-step description of the methods followed in making it.

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Standard Construction Methods

SECOND EDITION
490 pages, 6 x 9, 422 illustrations,
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CONTENTS: 1. Organization and Equipment. 2. Excavation. 3. Pile Driving. 4. Concrete Construction. 5. Wood Construction. 6. Brick and Stone Construction. 7. Steel Construction. 8. Roofing and Flashing. 9. Lathing and Plastering. 10. Scaffolds and Material Towers. 11. Erection and Rigging. 12. Pipework. 13. Painting. 14. Construction Schedules.

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CME 8-37



20-TON LOADS CUT DIRT-MOVING TIME ON ALL-AMERICAN CANAL

New Type Goodrich Tires Speed Work—Cut Costs

Outwest they do things in a big way. Right now they're building the All-American Canal—an 80-mile waterway from the Colorado River through California's Imperial Valley. It's one of the largest dirt-moving projects on record. Three and one-half million yards of earth will be moved before the canal is completed.

Big, massive trucks of the George W. Condon Co. haul away 20 tons of dirt at a load. But only with a new kind of tire were these trucks practical. Goodrich engineers designed a special tire (it weighs almost 500 pounds) just for such service.

At the Canal and at some of the big government dams, these tires not only withstand the strain of crushing loads

but carry on where the ground temperature reaches as high as 140°. They plow through loose sand, over jagged rock—all in all, the toughest jobs man ever handed tires.

These earth-mover tires are Goodrich Super-Tractions, specially-built huskies that can carry nine tons each. The tread design provides positive traction and resistance to spinning and sideslip. A riding bar in the center of the tires distributes the load and provides long, even wear.

Tires Triple Protected

Like all Goodrich Silvertowns, this tire is Triple Protected against sidewall breaks and blow-outs. This exclusive Goodrich construction actually checks 80% of all premature tire failures.

You don't have to have 20-ton loads in order to get the savings of Goodrich Super-Traction Silvertowns. These tires are available in sizes from 6:00-20 to 18:00-24—a size and type for every construction job.

Whether you need tires for trucks or air compressors, concrete mixers or tar kettles, scrapers or concrete buggies, the Goodrich dealer has a special tire at a money-saving price. Call him today for prices.

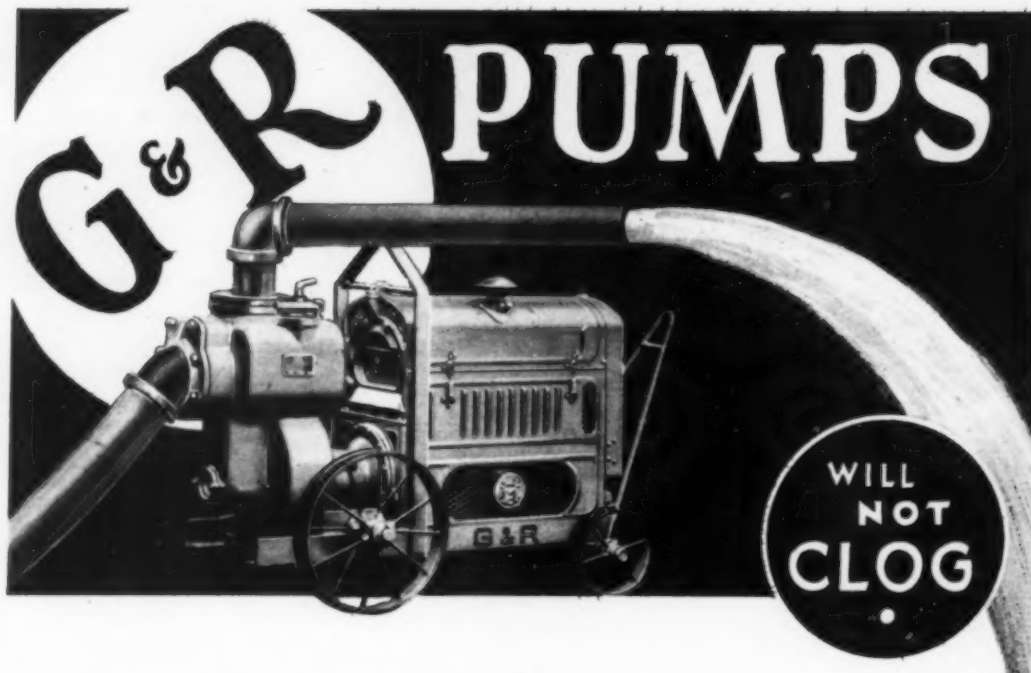


Goodrich Earth-Mover Tires at work on a government dam.

Goodrich ^{Triple Protected} Silvertowns

SPECIFY THESE NEW SILVERTOWN TIRES FOR TRUCKS AND BUSES
CONSTRUCTION Methods and Equipment — August, 1937

BUY ON PERFORMANCE NOT CLAIMS *For Claims* DO NOT PUMP WATER



The place to form an opinion of any pump is out on the job. There the pump must do its own talking, and with dirty water many a pump is inclined to stutter — and stop.

The Acme Construction Company of Everett, Washington, recently bought ten pumps. As they wanted to know what they could expect from the pumps on the job, they tried three well known pumps under identical conditions. When all three pumps had told their own

story, Acme bought G & R Pumps.

Arundel Corporation of Baltimore made a similar comparison of pump performance. They bought 15 G & R Pumps.

Remember this about G & R Pumps — **THEY WILL NOT CLOG — THEY ASK NO TIME OUT.** Play safe! Try a G & R Self Priming Centrifugal on your job before you buy any pump this year. We will ship you one and let you be the judge.

The most DEPENDABLE pump for the least money.

THE GORMAN-RUPP COMPANY, MANSFIELD, OHIO

--to make Dirt Moving Pay

BLAW-KNOX (ATECO) HYDRAULIC BOTTOMLESS SCRAPERS

The dependable performance of Blaw-Knox (Ateco) Hydraulic BOTTOMLESS SCRAPERS keeps dirt moving costs down—enables the contractor to operate his job on a definite schedule and at a profit.

It will pay you to investigate this BOTTOMLESS SCRAPER—also the Blaw-Knox (Ateco) Sheepfoot TAMPING ROLLER.



Send for
catalog



USE COUPON

BLAW-KNOX COMPANY
2086 Farmers Bank Bldg, Pittsburgh, Pa.

Please send:—CATALOG No. 1540—Blaw-Knox
(Ateco) BOTTOMLESS SCRAPERS ☐

Please send:—CATALOG No. 1550—Blaw-Knox
(Ateco) Sheepfoot TAMPING ROLLERS ☐

Individual

Company

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SPEED UP NUT TURNING



**THE IDEAL TOOL FOR CONTRACTORS WHEN
TIME IS OF UTMOST IMPORTANCE**

Works on a Quick Straight-Ahead Ratchet Movement
The new metal now used in Handles, Heads and Pawls enables the "Favorite" to stand up under harder and rougher usage.

Ratchet movement eliminates all lost motion. Does not leave the nut until operation is completed.

A Time-Saver

Can be used in narrower places than an ordinary wrench. Each head can turn two different-sized nuts—one in each end. Opening in head allows bolt to pass clear through.

SEND FOR FULL PARTICULARS

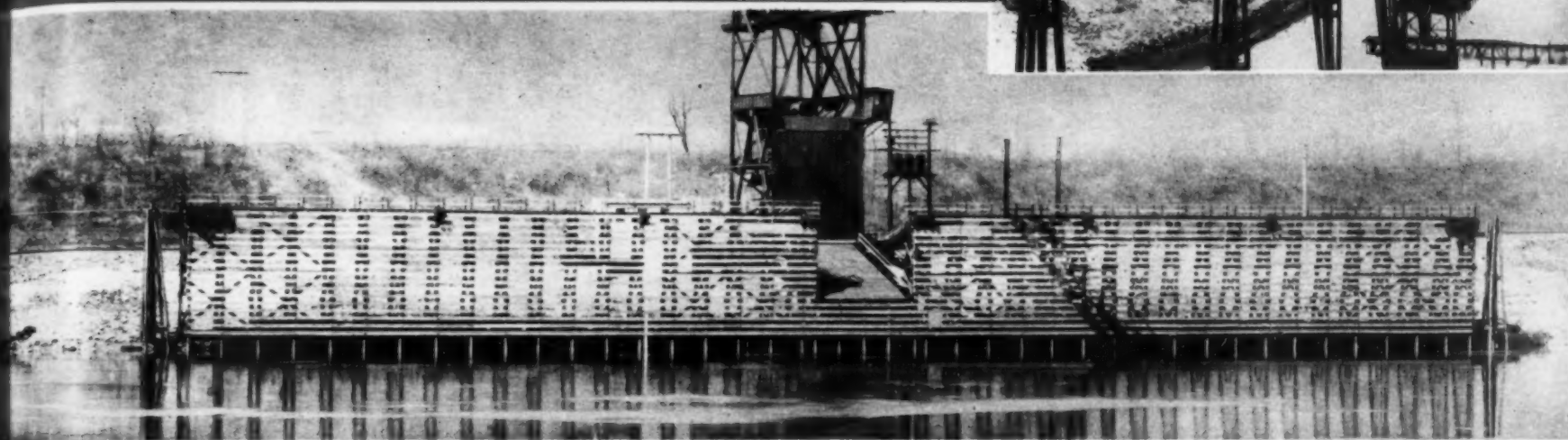
GREENE, TWEED & CO.

SOLE MANUFACTURERS

109 DUANE STREET

NEW YORK, N. Y.

KOPPERS



THE WOOD PRESERVING CORPORATION Supplied Pressure-treated Creosoted Lumber for Modern River-rail Terminal

These photographs show a \$450,000 river-rail coal transfer plant built with pressure-treated lumber from The Wood Preserving Corporation, Koppers subsidiary.

The pressure-treated timber breastwork is 400 feet long, and at either end of it are 24 mooring pile clusters at which barge fleets are tied up.

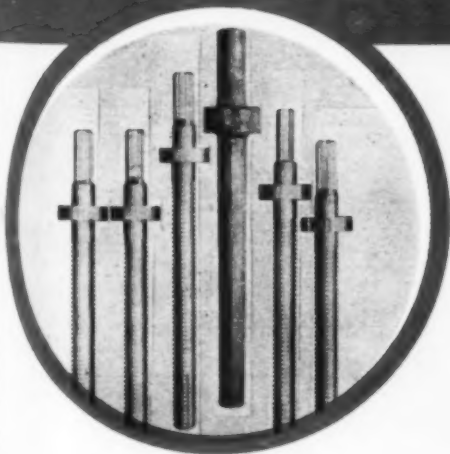
The Wood Preserving Corporation has 22 wood-treating and wood-working plants located through the country, where piles, cross ties, poles, bridge and dock timbers, cross arms, fence posts, crossing plank, cribbing, conduit and car stock are pressure treated with preservatives to prevent decay, termite and marine borer attacks.

THE WOOD PRESERVING CORPORATION

A Koppers Subsidiary

Koppers Building, Pittsburgh, Pa.

BARTLETT HAYWARD BRONZE STEMS FOR WATERWORKS VALVES AND GATES

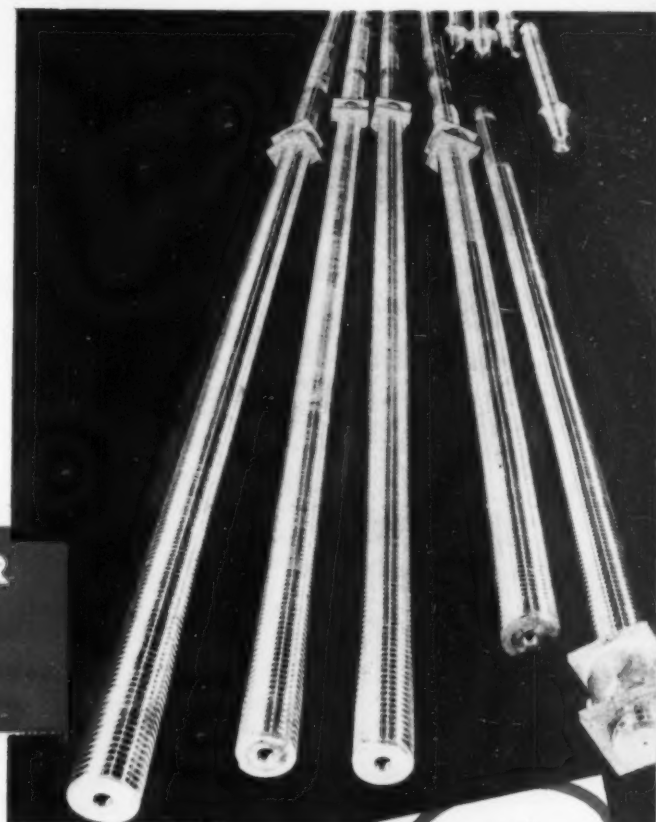


Forged D-H-S #2 Bronze Rough
Forged and Machined Stems.

To insure perfect forgings, continuous and painstaking metallurgical and thermal control under one single responsibility is essential. Otherwise forging may be done above or below the extremely narrow critical temperature range, and result in laminations, seams or checks—often invisible, but constituting a definite hazard. Bartlett Hayward Division insures perfection by carrying on every operation—from alloying and billet manufacture, through casting or forging to final rough-turned or completely machined stems—under one roof, and under unified supervision. Results are apparent wherever Bartlett Hayward valve stems are in use. You'll be pleased with the promptness of quotations and deliveries.

KOPPERS COMPANY

Bartlett Hayward Division, Baltimore, Md.



Stems, 4" dia. x 22' 9" long. B-H Forged
Manganese Bronze—K-B 30 Alloy.

Report of Physical Properties

Material. K-B 20 Alloy
U.T.S. 80,000 #/sq. in.
Yld. Pt. 40,000
Elong. 2" 20%
For High Grade Man-
ganese Bronze Appli-
cations.

Report of Physical Properties

Material. K-B 21 Alloy
U.T.S. 65,000 #/sq. in.
Elong. 2" 25%
For Ductile Manganese
Bronze Stem Applica-
tions.

Report of Physical Properties

Material. K-B #2
U.T.S. 115,000 #/sq. in.
Yld. Pt. 90,000
El. Limit. 55,000
Elong. 2" 12%
For High Pressure
Rigorous Service

HIGHEST COMBINATION OF
PHYSICAL PROPERTIES—
SUPERIOR FOR ALL STEMS

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Marking Paints ... Pipe ... Pressure-treated Poles, Posts ... Elastic
Gates ... Tanks ... Tarvac Road Tar ... Tarvac Handbook ... Treated
Timber ... Waterproofing ... Waterworks Gate Valves ... Wood Killers



"VULCAN" HOIST HOOKS and ROPE SOCKETS

WILLIAMS' "VULCAN" Hoist Hooks are drop-forged from selected steel and specially heat-treated to increase their strength and toughness and reduce liability of breakage. Each hook is individually proof-tested to 50% beyond its rated "safe working load". You can identify "Vulcan" Hooks by the orange tip. Shank and Eye Patterns up to 25 ton capacity.

"VULCAN" Wire Rope Sockets are drop-forged, without welds, from a fine grade of steel. They are superior in strength and safety — stronger than the strongest rope each will accommodate.

Both Open and Closed Patterns, for wire rope $\frac{1}{4}$ to $1\frac{1}{8}$ " diameter.

J. H. WILLIAMS & CO.

75 Spring Street, New York

Headquarters for: Drop-Forged Wrenches (Carbon and Alloy), Detachable Socket Wrenches, "C" Clamps, Lathe Dogs, Tool Holders, Eye Bolts, Hoist Hooks, Thumb Nuts and Screws, Chain Pipe Tongs and Vises, etc., etc.



LAUGHLIN
Industrial Hardware

Specializing for over 70 years in the design and manufacture of wire rope and chain fittings, LAUGHLIN has established a record of dependability through the use of the best metals and other materials, expert workmanship, modern machinery, and rigid inspection.

Send for catalog showing the complete line of LAUGHLIN Industrial Hardware.

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Portland, Maine
Manufacturers of Industrial and Marine Hardware Since 1886

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Los Angeles San Francisco Seattle Denver

Sterling
SELF-PRIMING PUMPS

Sterling
MACHINERY CORPORATION
Kansas City, Missouri, U.S.A.
411-13 Southwest Boulevard

GENERATING PLANTS
WRITE FOR NEW CATALOG TODAY

An Owen Bucket

FOR EVERY CRANE

TO INSURE
A BIGGER

DAY'S
WORK

The efficiency of any "rig" you buy and the returns on your investment will be determined largely by the bucket you hang on its boom.

There is a type and size of Owen Bucket particularly adapted to the characteristics of each and every crane---a unit that will insure maximum results under every condition of service. Write for the new catalog.

The Owen Bucket Co.

6020 Breakwater Avenue
Cleveland, Ohio

Branches: NEW YORK PHILADELPHIA CHICAGO BERKELEY, CAL.

A MOUTHFUL AT EVERY BITE

Buckeye

50 Clipper



**SEE THE CLIPPER
before YOU BUY**

any
1/2 - 5/8 or 3/4 YARD
EXCAVATOR this year

Every operation is controlled by a Metered Vacuum System never affected by changes in temperature. All operator's movements are practically effortless — Swing brake sets automatically — Rotation stops without reversing the swing clutch — You can swing, travel and hoist simultaneously. The handiest and most comfortable cab on any excavator.

METERED VACUUM CONTROL

**A
MODERN
full revolving
EXCAVATOR**
Convertible
SHOVEL
TRENCH HOE
CRANE
CLAMSHELL
DRAGLINE

THE BUCKEYE TRACTION DITCHER CO.
FINDLAY, OHIO, U. S. A.

THE BUCKEYE TRACTION DITCHER COMPANY FINDLAY, OHIO

☐ Send complete information on the Buckeye Clipper, Metered Vacuum Controlled Excavator

- ☐ Model 50 - 1/2 yard
- ☐ Model 60 - 5/8 "
- ☐ Model 70 - 3/4 "

- ☐ Shovel
- ☐ Trench Hoe
- ☐ Crane
- ☐ Clamshell
- ☐ Dragline

☐ Send a Sales Engineer

Date 1937

Your name

Company name

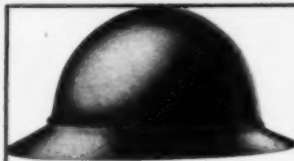
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ENGINEERING and DESIGN as MODERN as TOMORROW

M·S·A SKULLGARDS

Take head-injury costs off the books



TYPE "K" HAT



TYPE "B" CAP

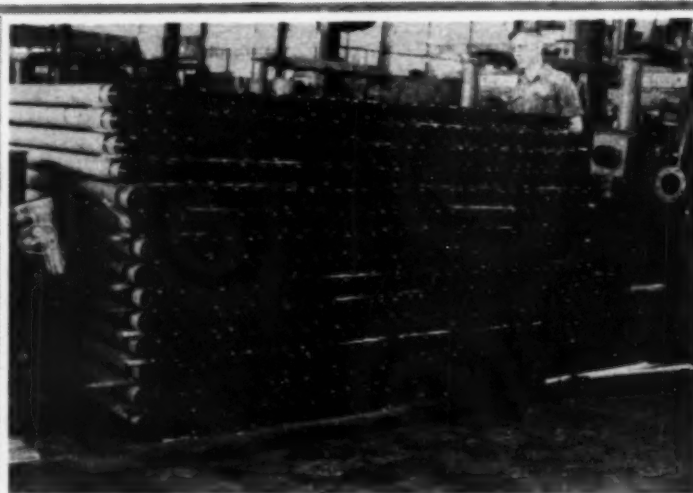
Head injuries are a common hazard to all industry. The head is a vulnerable point; flying particles, falling tools or materials, dripping chemicals and other hazards too often cause expensive accidents. • But, where M.S.A. Skullgards are used, the number and severity of head injuries drops sharply. These cool, lightweight, comfortable head protectors molded of Micarta are chemically resistant, non-softening from water or perspiration, and nationally famous for their all-around protective efficiency and fracture-resisting strength. Eight types are available, in all necessary sizes. • Write for details and prices.



MINE SAFETY APPLIANCES CO.

Braddock, Thomas and Meade Streets, Pittsburgh, Pa.
District Representatives in Principal Cities

M. S. A. Products include: Breathing Apparatus, Inhalators, Gas Indicators, Gas Detectors, Safety Goggles, Protective Hats and Caps, Edison Electric Cap Lamps, Safety Clothing, First Aid Equipment. Descriptive Bulletins will be sent on request.



READY TO GO

The picture shows half of eight hundred Wellpoints ready for shipment to our next big job — Dam #25 on the Mississippi River.

An ever-growing number of contractors in this and eleven foreign countries depend on the MORETRENCH WELLPOINT SYSTEM to produce DRY RESULTS-AT THE LOWEST COST-ON ANY WET JOB

MORETRENCH CORPORATION

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90 West Street, New York

Plant:
Rockaway, New Jersey

WISSCOLAY PREFORMED WIRE ROPE

ALWAYS SPOOLS EVENLY

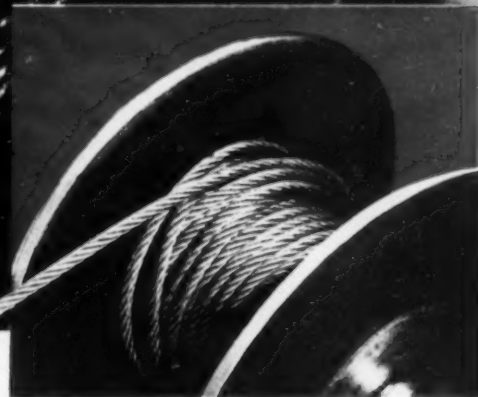
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A Preformed Rope always runs straight. When spooling it on the hoisting drum there is no tendency for it to travel sidewise because it does not rotate around its own axis. Spaces are not formed between rounds. Subsequent layers fit evenly within grooves formed by closely fitting rounds of the underlying layer. Due to its smooth winding tendencies Preformed Rope does not

suffer from early destruction by abrasion and crushing. Longer life because of better spooling is only one of the many economies of Preformed Wire Rope. Write us and we will gladly tell you if Preformed Wire Rope is best suited for your particular use of wire rope.

WIRE ROPE

by Wickwire Spencer



Haphazard winding greatly shortens the life of Wire Rope

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WICKWIRE SPENCER SALES CORPORATION, New York, Chattanooga, Tulsa, Portland, Seattle.



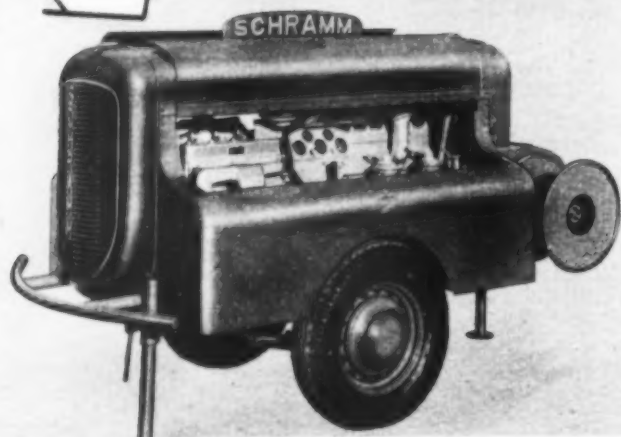
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41 East 42nd St., New York City

Please send me my free copy of your popular, new money saving manual, "Know Your Ropes".

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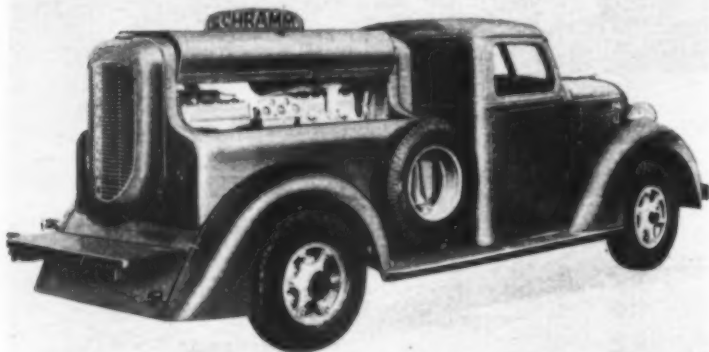
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utility**

LIGHTWEIGHT COMPACT compressors



• Above — LIGHTWEIGHT "Utility" Compressors in DeLuxe mounting style reduce weight as much as 2000 lbs. — saves hauling costs.

• Below — A model 105 "Utility" on 3/4 ton truck. COMPACT "Utility" dimensions mean smaller trucks — lower transportation costs.



SCHRAMM "Utility" Compressors are the lightest, most portable, most compact compressors ever built. With surplus weight eliminated, transportation and labor savings mount to new heights — costs go down. "Utility" sizes from 85 to 420 cu.ft. actual air delivery — either gasoline or diesel engine powered. Seven mounting styles for all models. Buy the "World's Most Modern Compressor" — the SCHRAMM "Utility"

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SCHRAMM

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PRIME
FASTER
PUMP MORE
WATER
PUMP MORE
HOURS

Capacities
up to
220,000 G.P.H.

JAEGER "HANDY"
LOWEST PRICED
7000 G.P.H. PUMP

Send for our latest Catalog
P-37 and Prices

JAEGER "SURE PRIME" PUMPS

THE JAEGER MACHINE CO.

800 Dublin Avenue

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THROUGH TRAFFIC—
PATCH THREE HOURS OLD

A patch that is *all concrete* — A patch that can be opened to traffic three hours after it is finished — A patch that is made largely from old broken concrete —

A patch that requires no barricades or red lights — A patch that costs less to make yet gives more employment to more men — A patch appreciated by road patrolmen as much as by the traveling public because road is opened to traffic before dark — Truly a wonderful *All Concrete Road Patch* made possible by VIBRATION — the INTERNATIONAL WAY.



AIR MOTOR OR GAS-DRIVEN
VIBRATOR

A complete photographic record of one specific patch showing complete details of each operation sent upon request.

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Subsidiary - THE INTERNATIONAL STEEL TIE CO. - CLEVELAND, OHIO



Tight

... IN A BIG WAY!

KEEP GOING WITH Snap-on Tools

Powerful muscles . . . a long hard pull . . . a big bolt — this combination demands a tool that can take it—a tool that gives your men the assurance of safety and enables them to put all their "beef" into the job.

Snap-on Extra Heavy Duty Sockets can't slip off the nut . . . they grip on all sides and stay put until you remove them. Available in 1-7/16" to 3-1/8" opening sizes. The big Ratchet Wrench, with its 36-in. leverage, has the power to turn any nut in this socket range.

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Snap-on builds a complete line of hand tools . . . available through its own distributing warehouses located in 37 principal cities. See Snap-on Tools in your phone directory or mail coupon for free 136-page catalog.

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37 Branch Warehouses



Snap-on Tools, Inc., Kenosha, Wis.

Without obligation

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No. 73 Extra Heavy Duty Ratchet

Name

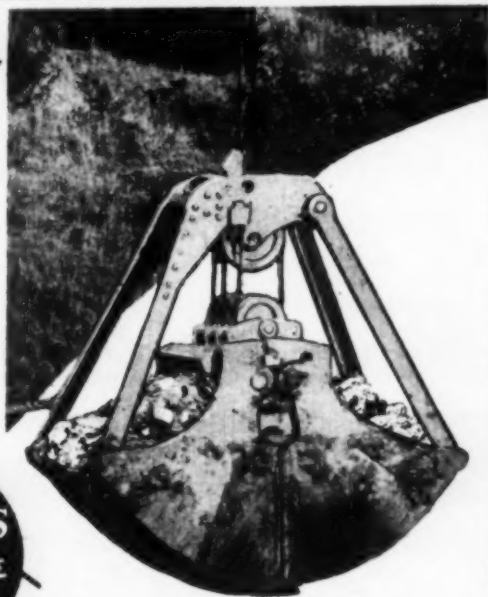
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*Outdigs
Others
of its
type!*

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Multiple-Rope
Bucket



A MONEY MAKER!

The DOUBLE HINGE feature of Williams Multiple-Rope buckets makes for greater rigidity and power—and gives you a longer spread of the open bucket. Order one of these super diggers for your next job and see for yourself. Write for bulletin.

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WILLIAMS POWER-ARM, POWER-WHEEL
MULTIPLE-ROPE, DRAGLINE
Buckets



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Spring washers and lock washers of every type and size, including the well-known Hipower and Kantlink types. There are thousands of more places where spring washers would improve the value of any product where bolts, nuts, cap or machine screws are used.



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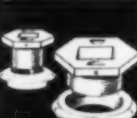
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Spring retaining rings of special heat-treated spring steel are carried in many stock sizes—both open and closed types. Use of a spring retaining ring is an excellent manner of creating a shoulder on a shaft.



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Forged steel handles for heavy containers—can be rigidly welded, riveted or attached by a strap to lie flat when not in use. Rugged and most satisfactory for hard usage.



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Forged and machined fittings for steel barrels, drums, tanks and metal packages, including plugs, rings and flanges. Very rugged for use in transportation of alcohol, turpentine, oils and other expensive liquids.



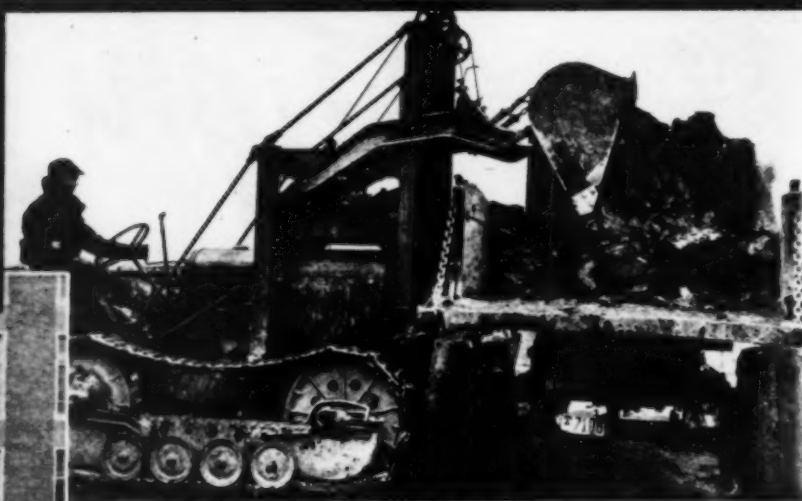
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Other products include windows for buses and railway cars, railway car window curtains, curtain rollers and fixtures, sash locks and lifts.

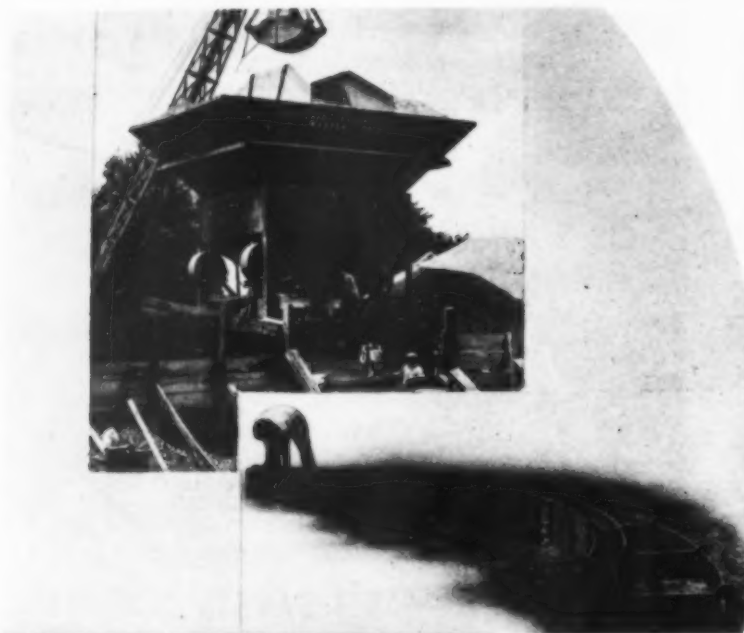
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TRACKSON HIGH SHOVEL



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EVERYTHING
I NEED FROM
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STREET FORMS

BINS and BATCHERS



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THE HELTZEL **STEEL FORM
& IRON CO.**
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Outstanding IN DURABILITY STRENGTH ACCESSIBILITY



EMSCO TRACTOR EQUIPMENT:

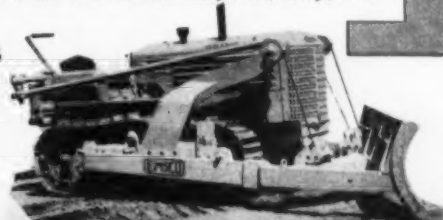
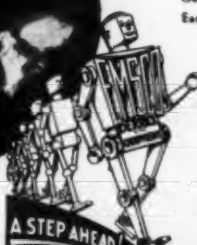
Cable-Controlled Bulldozers; Trailbuilders; Scrapers; Power Control Units; Cable and Hydraulic Controlled Rippers.



Emsco Cable-Controlled Bulldozers and Trailbuilders are designed for varied and the most severe operating conditions. Their extra built-in stamina is demonstrated constantly by superior performance in the hardest service. Exclusive patented features provide highest efficiency, exceptional speed and flexibility, with low operating and maintenance costs and long life. Recognized by contractors and roadbuilders everywhere for their ability to stand up and deliver under all conditions, assuring complete satisfaction. Built for all popular models and sizes of track-type tractors, and powered by the efficient Emsco Winch in either single or double drum type. Write for Bulletins No. 17-TC (Trailbuilders) and No. 18-TC (Bulldozers).

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TRACTOR EQUIPMENT DIVISION

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Genuine Solid Shank Shovel

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- RED EDGE
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- KNOX-ALL
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**Saves More Than
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GUARANTEES
Your Profit**



Through stone, concrete, plaster, brick — nothing stands in the way of a Speed-Way Electric Hammer. 1,800 powerful blows per minute. Takes drills to 1 1/4" diameter. Handy — wt. 26 lb. Built for 20-year service. It's a money-maker — makes 1 man equal to 10. Always the standard — there are more Speed-Ways in use than any others.

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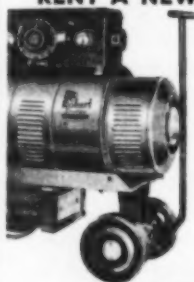
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White Mfg. Co.

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YOUR OWN MEN CAN USE IT.
It will save you hundreds each
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30 DAYS TRIAL

At our risk — rent to apply on the
purchase if desired. Also demon-
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Be sure it's the GIANTGRIP STRAIGHTEDGE

Either Steel or Aluminum

For Checking Concrete Surface

Two usable edges: — one sharp-cornered and
squared for scraping; the other rounded for
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(Division of Mondie Forge Co.)

10274 BEREA ROAD

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Distributors In
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Principal Cities

GRIFFIN WELLPOINT CORP.
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On this page ✓

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are also interested in anything that has a part in
efficient and economical construction operations.
How logical, then, to convey information of appro-
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to these men through advertising right here on this
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**CONSTRUCTION Methods and
Equipment**

330 West 42nd St.

New York City

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THE 1937 EDITION OF

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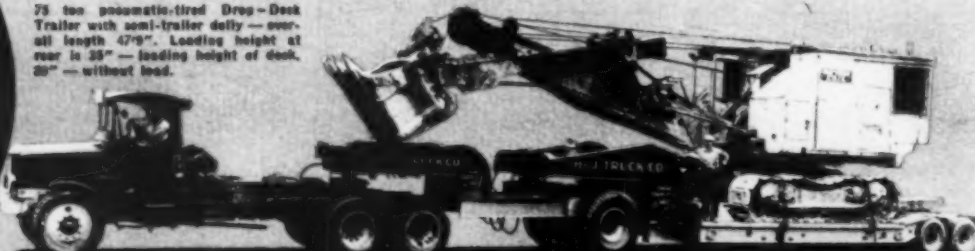
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Gooseneck Trailers bring the
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75 ton pneumatic-tired Drop-Deck
Trailer with semi-trailer dolly — over-
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ASH HANDLING MACHINERY
Barber-Greene Co.

ASPHALT
Texas Company

ASPHALT PLANTS
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Hetherington & Berner, Inc.

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Link Belt Co.
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Inland Steel Co.

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Heltzel Steel Form & Iron Co.

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Goodrich Rubber Co., B. F.
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Chain Belt Company
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Roebling Son's Co., J. A.

CABLEWAYS
Roebling Son's Co., J. A.

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Koppers Company

CASTINGS, IRON & STEEL (alloy)
International Nickel Co., Inc., The

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330 West 42nd St. New York City

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Lone Star Cement Corp.
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Bucyrus-Erie Co.
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Harnischfeger Corp.
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Link Belt Co.
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Thew Shovel Co.
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Thew Shovel Co.
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Sterling Machinery Corp.

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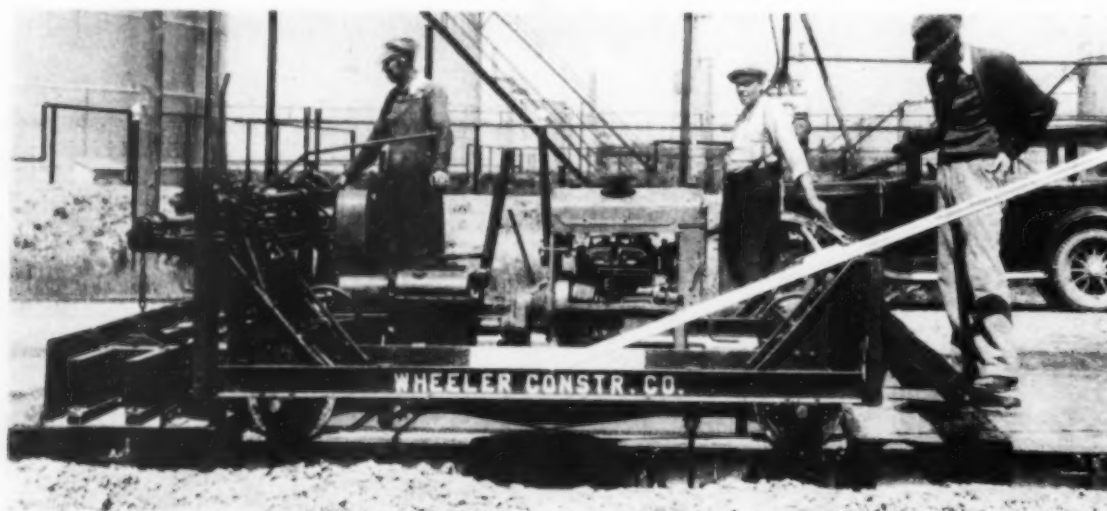
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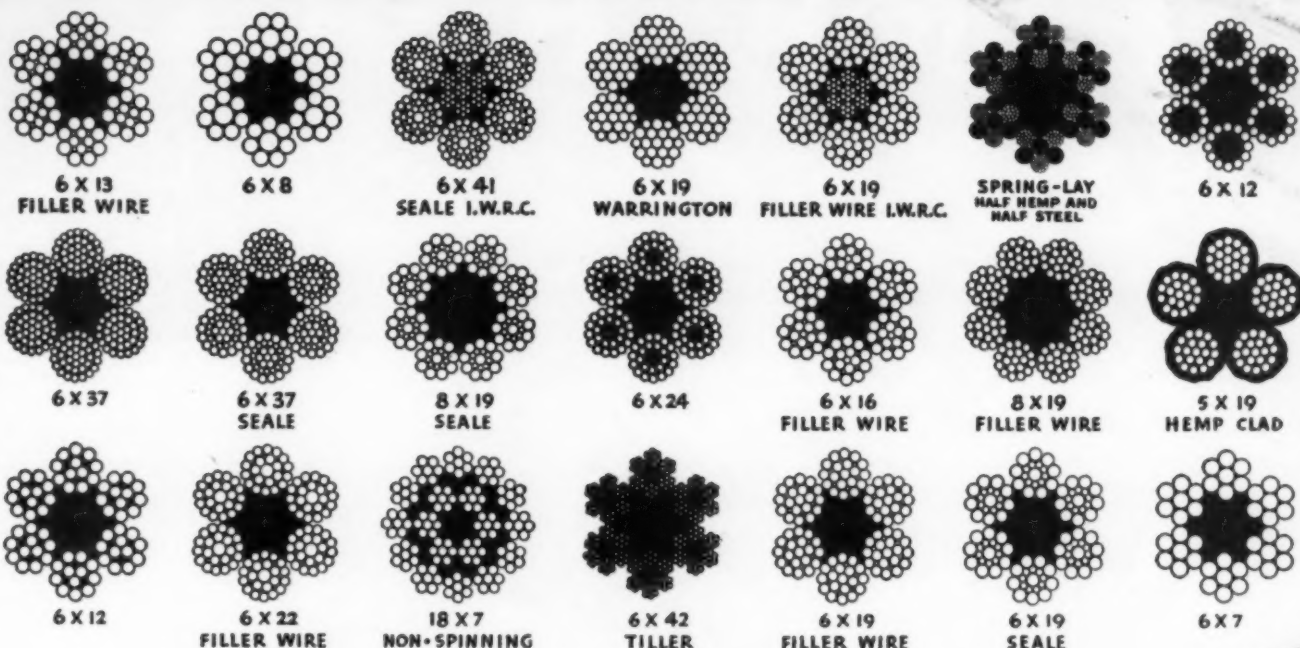


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